ABSTRACT

A SYSTEMS THEORY APPROACH TOWARD THE RECONCEPTUALIZATION OF CURRICULUM

By

Leo Dworkin

The major purpose of this study was to consider curriculum as a social system. This formulation of curriculum was developed so that educators could have the use of a conceptual viewpoint that would enable the application of systems and model theory to the problems of curriculum change. A secondary purpose of the study was to develop the basis by which curriculum change could be assessed in terms of its potential consequences.

In order to develop the necessary conceptual frameworks for a humanly oriented approach, concepts were derived from the fields of: (1) mathematics, (2) general systems theory, (3) philosophy, (4) social systems theory, and (5) various behavioral sciences. The concepts of set, isomorphism, model, systems and social system were the major foundations upon which this conceptual framework was established.

The traditional and popularly held theory of curriculum usually refers to a "course of study." In professional practice curriculum is defined as all of the experiences of the student under the direction of the school. The first conception of curriculum, in terms of a systemic approach, refers to a single element (properties) and consequently lacks explanatory power for the consideration of change. The second concept implies a systemic approach but fails to identify the elements of the system and their interconnections.

In order to facilitate a revitalized orientation toward curriculum, an explicit formulation of the conceptual frameworks of curriculum viewed as a social system was made. In this context, curriculum was defined as a social system composed of the interactive elements of persons, processes, and properties organized for the purpose of providing the conditions necessary for continuing educative experiences.

The unique aspects of considering curriculum as a social system are to be found in its elements and their interactive relationships. Change in a system (curriculum event) is generated from the interactive relationships of the elements of the system. To the extent that characteristic effects are identifiable

from such relationships, it is possible to estimate the probable consequences of a change in conditions meant to facilitate educative experiences.

Because each set of relationships generates characteristic effects and consequences, models can be derived to diagnose the condition or state of a system. The models can then be used to suggest strategies for change in terms of realizing the purposive functions of the system.

Using the new model of curriculum as a starting point several models were derived to serve as means for analysis, decision-making and planning for change in curriculum improvement and development.

The models are meant as examples rather than exemplars and, as such, can only acquire further value from a systemic viewpoint as they are tried, tested and modified in empirical situations. The models derived from the model of curriculum viewed as a social system were: (1) A Model of Symbolic Distance, (2) A Model for the Expansion of Shared Meaning, (3) An Analog Model of the Change Process in Curriculum Viewed as a Social System, (4) The Qualitative Control of Consequences in the Curriculum System, (5) A Model of Symbolic Orientation, (6) A Concern Matrix for Curriculum

as a Social System, and (7) A Model of Systemic Disorders.

Change, in the context of this study, is considered to be a reordering of the relationships that obtain between the interactive elements of the system. In this sense, a consequence is any result or output of a curricular system. From this point of view, the potential consequences of change are amenable to the methods of intelligence as applied by means of models to diagnose and restruct the system to achieve planned change. Curriculum, from this perspective, is never a completed object, but rather a system in a state of change where the focus of change is intended to facilitate educative experiences for the persons in the system.

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To Alva, Deborah and Jeffrey, whose help and faith made all things possible.

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INTRODUCTION

Introduction to the Study

Because of the intensity of social tensions that have activated pressures toward change, increasing efforts to respond to social problems have been made in the educational arena. Although there is both a variety and abundance of innovative change in curriculum, the attempts toward improvement seem to have remained on the level of piecemeal tinkering.

Many scholars in the field of curriculum have noted the necessity to create new conceptual foundations in order to make significant progress toward the development of improved curriculum theory. The need is apparent for a conceptual framework and universe of discourse upon which to build new approaches toward the reconceptualization of curriculum.

Because of their capacity to integrate diverse factors into a viable total, the most promising developments to date are those employing General Systems Theory. A variety of systems approaches in the field of business, government, biology and the military have been used and

are being applied to education. The use of systems theory in education has been met with both positive and negative feelings. Both opponents and proponents of systems approaches have clouded the issue of its value by failing to develop a clear understanding of its meaning. A system, simply defined, is a collection of elements and their interconnections viewed over a period of time.

The ultimate purpose of a systems approach is to provide its user with a sound decision-making process. This purpose is accomplished by enabling the decision-makers to consider all elements and their interconnections in the context of a series of options, one or some of which are of greater utility, effectiveness, and benefit in outcomes than are the others.

A human being is a living system composed of subsystems and is involved in and a part of a suprasystem (his social system). Man lives in a universe of change. The continuing processes of birth, life, growth, development, decay and death are structurally a part of him and his world. What man becomes, in large measure, depends upon what he does to himself and what people do to him and to each other.

To derive decisions which help him make his way through the tangle of problems that beset him, man makes

use of models. That is to say, he has certain constructs which affect his thinking and behavior. The term "model," as used here, requires definition. This definition in turn depends upon two definitions associated with set theory in mathematics: (1) the definition of a "set" and (2) the definition of "isomorphism." A set is considered to be a carefully defined collection of elements. The term isomorphism pertains to a relationship between two sets. Two sets are said to be isomorphic if, (a) there is a one-to-one correspondence between the elements included in the respective sets, and (b) if certain structures are common to them.

If two sets are found to be isomorphic, either set can serve as a model for the other. It is in this context that man employs models to derive decisions about the world around him. Organizing, making sense of and interpreting his perceptions of the world by means of models, in turn, affects the way in which man perceives the world.

Within the limits of certain structural "givens" in the cycle of his development the human being is richly plastic. That is to say, what he is capable of becoming is inherently diverse and subject to wide variation. The major constraints to what he might become, excluding biological ones, are to a large extent defined in the

context of social interaction. The social system operates to set the pattern and direction of development of its individual and collective members.

Man lives in and is involved in systems. He makes sense of the world by means of models. The nature of his experience as it is affected by his conceptual orientation is an important aspect governing the process of his becoming. Whether or not man is aware of the systems and models with which he functions, they operate and determine the outcome of educational effort. With an awareness of systemic analysis and model construction, the ongoing processes of change affecting human purposes become accessible to planning and open to choice. It should be noted, however, that we can, by carefully selecting means and ends, or purposes and goals, develop powerful methodologies for doing very efficiently that which is not worth doing in the first place. Even worse, we can more effectively constrain the process of becoming to a meagre model of man's potential. On the other hand, we can do very effectively that which we judge to be highly worthy.

Leslie J. Bishop explains that change involves modification of the system-structure. In Bishop's view, the systems approach can be an important resource to

those who are concerned with the whole network of experiencing and learning.[1]

If curriculum is viewed as a social system, then the development of conceptual frameworks capable of handling its complex variables is an important step in its reconceptualization. Systems analysis and model theory, applied in a humanly oriented system, furnish educators with the means by which human purpose and choice can become operative. With a new awareness for fostering the extension of man's ability to act with the realization of consequences, new possibilities for enriching human potentials can emerge.

Purpose of the Study

The purpose of this study is to consider curriculum as a social system so that curriculum personnel may have the use of a conceptual viewpoint that will enable the application of systems and model theory to the problems of curriculum change. Secondly, it is the intent of this study to develop the basis by which curriculum change can be assessed for decision-making in terms of its potential consequences.

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[1]Leslie J. Bishop, "The Systems Concept," Educational Leadership, Vol. XXIV (May, 1967), p. 676.

Background of the Study

The Forces of Change

The forces of change have brought education to the brink of a new era. With each new confrontation in both the struggle for power and the desire to close the gap between our ideals and our practices, a storm of criticism is leveled at the educational establishment. Changes with roots deeply embedded in the previous century are in the process of rapid and intensified acceleration. As jobs became more specialized and child labor was removed from the economic market place, it brought about the necessity to keep children in school for a greater number of years. Later, compulsory education kept still greater numbers of children in school and was responsible for the democratization of the educational program with the idea of a basic minimal education extended in most cases through high school.

Today the influence of change has meaning in still another sense. The connection of technological advance with political unrest has literally forced a race toward improvement on the educational scene. Robert J. Blakely describes the changes that have been forced on American education by recent international events:

> To have the Soviet Union be first in space was a traumatic experience for the American people. Perhaps it was because we found ourselves bested in an area where we had considered ourselves without serious rival: the large scale application of science to technology. This triggered off a reexamination of education which had been gathering force for a number of years. The first statements tended to be frenetic and hysterical, many people calling for radical reorganization of our schools to produce mathematicians, scientists and engineers as sharply tooled for particular purposes as the rockets themselves were tooled.[1]

In every crisis situation a political process begins in which the various sectors of the social system seek to fix blame. Despite the obvious failure of political administrations to provide either direction or funds, they tended to shift the burden of response to educators, a fact which has increased pressures for change.

Each new social crisis brings a rash of critics storming down upon educators with panaceas for improvement. Automation, social security, and a longer useful life-span point toward an education that must develop as a safeguard for the young against delinquency and become a positive step in the direction of mental health in a world of anxiety and unrest.

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[1]Robert J. Blakely, "The Copernican Revolution in Attitudes," Changing Attitudes in a Changing World (New York: Associates of Bank Street, Conference Report, 1958), p. 24.

Peter F. Drucker, in speaking about the effect of automation on education, points out the increasing need for the creative mind and the adjustability of the individual to job situations that will be subject to frequent and excessive change.[1] It is already evident that changes in the educational scene are under way to meet increasing efforts needed to get and hold a job and for the rehabilitation of the "hard core" of the technologically unemployed.

The maintenance of world leadership as a powerful force in favor of democracy will necessitate an even closer look at curriculum practice in order to build in our citizenry a strong conviction and understanding of democratic values for the present and for the uneasy years to come.

Since our other institutions are also caught in the intensified trauma of change, education is expected to play an important role in the amelioration of social change. Riots in Watts, Newark and Detroit have resulted in divergent analysis and requests. For those who believe the cause of racial unrest to be primarily a matter of racial inequality in matters of opportunity, the

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[1]Peter F. Drucker, America's Next Twenty Years (New York: Harper and Bros., 1957), p. 30.

answer seemed to be equalization of educational opportunity. For some, the emphasis was placed on desegregation schemes advocating bussing, redrawing school boundaries and/or the centralization of the school plant. For others still there is a battle for community control of schools. Because of the new-found power of teachers and their movement toward both negotiations and increased professional standing, the future will hold still further conflict.

As educators, we are not only held responsible for the problems, we are accused of being effective in the promotion of social ills and ineffective in almost everything else. The intensified pressures for accountability particularly on the part of the public that augurs for improved education for children that are designated as educationally deprived, should cause the profession to seek both more effective means and ends for its own reconstruction.

Obviously, the concepts of education must undergo fundamental changes if it is to become a serious factor in providing leadership in social change. John I. Goodlad concludes that if an examination of the rates of nonpromotion, dropouts, alienation and minimal learning are any

indication, one could believe that the schools are obsolete.[1]

Everett Rogers describes the rate of change in education in terms of an extensive review of literature.[2] In his review of the work of Paul Mort and his students it was found that a period of fifty years was needed to achieve a change from the conception to the adoption of a new idea. Current studies indicate a rate of change closer to five years. As the rates of change have accelerated, it has become evident that new ways must be found to cope with the complexities of change.

Negative reactions are widespread concerning the effect of our increased abilities to effect changes. We are not at all certain the problems and issues that we had intended to improve were in fact improved. What has become increasingly ironic is that while we have more dollars for experimentation, a vastly expanded ability to increase the flow of information, and the techniques for speeding adoption, we still have barely demonstrated that what we can now do more rapidly was worth doing in the first place.

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[1]John I. Goodlad, "The Future of Learning and Teaching," AV Communication Review, Vol. XVI, No. 1,(Spring 1968), p. 5.

[2]Everett M. Rogers,"Toward a New Model for Educational Change" (mimeographed paper presented at the Conference on Strategies for Educational Change, Washington, D. C., 1965), p. 2.

> "The very promising curriculum revolution" of the 1950's and 1960's was far less successful than it might have been because it tried to improve education generally by improving just one component of the system, the curriculum. There is now ample evidence that improving the curriculum is an insufficient step in school improvement, concomitant changes are necessary in the rest of the system.[1]

In light of the results of recent efforts, it has become clear that there is a need to consider curriculum as a system. One of the most highly publicized curriculum reforms occurred in the field of mathematics. The results of the failure to really conceptualize curriculum as a total system are very highly visible in an examination of the results.

> Many experts in the vanguard of the new math movement say what has happened to new math in the hands of the old mathers is worse than what happened to old math when taught by old mathers.
>
> They insist too many math teachers think they are teaching new math if they just use new terminology, yet keep the same old drill, repeat, test, drill techniques. What new mathers want is an explore-discover approach to the subject.
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> Some experts insist new math hasn't begun to be taught yet and that almost all that parades under that name really isn't . . .[2]

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[1]Francis A. J. Ianni, Culture, System and Behavior: The Behavioral Sciences and Education, The Foundation of Education Series (Chicago: Science Research Associates, Inc., 1967), p. 124.

[2]Christian Science Monitor, (April 30, 1966), p. 1.

The curious set of circumstances reported here can be noted in reference to almost any of the current innovations whether they are in subject matter areas or organizational methodology. As Goodlad reports:

> . . . Curriculum planning takes place in such a piecemeal fashion that across-the-board examination of the total school experience of children and youth is not likely to occur.[1]

What becomes painfully obvious is that if education is to do anything more than imperfectly transmit culture, it must make the massive effort called for by John Dewey to reconstruct the basis and conception of education. The school in his terms must become a part of the social reality and the social reality must become a part of the school. The systems approach offers at least one promising way toward the reconceptualization of the problems involved in reconstructing our social experience.

Universe of Discourse

Some educators have led themselves into a faulty conception of language usage by admonishing each other to use the language of simplicity. What has been miseducative in this notion is a confusion of purpose.

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[1]John I. Goodlad et al., The Changing School Curriculum (New York: Ford Foundation, 1966), p. 17

The educator works in a social system. He communicates to many publics, such as teachers, students, parents, administrators as well as other kinds of professionals. As in the case of medical doctors, lawyers or engineers, his use of a layman's language for the general public should be one type of matter, while his professional understanding and utilization of a language for his professional colleagues should be quite another.

When the attempt is made to bring clarity and precision into language for the development of any given field, a departure is made from everyday usage. The lawyer consulting with his client may employ technical terms but they are geared to explicating ideas that are to be understood by his client. In discussing some aspect of a case with another lawyer, his language again shifts into another but more precise universe of discourse. Thus, to reject common usage where a language is to be used as a resource for the development of a systematic conceptual framework is not to reject it where it is desirable and applicable to everyday human interactions.

The recognition of the need to develop a universe of discourse is prevalent in the efforts of many thinkers.

Jeromme Bronowski, in an effort to demonstrate that art and science have striking and vital similarities that could form the basis of mutual understandings, pointed out

> When Coleridge tried to define beauty, he always returned to one deep thought: "beauty, he said, is unity in variety." Science is nothing else than the search to discover unity in the wide variety of nature - or more exactly in the variety of our experience. Poetry, painting, the arts are the same search . . . for unity in variety.[1]

In the field of foreign relations, practitioners either learn each other's language, use a translation, or learn a language common enough to others to function as a universal language. The story of the difficulty of agreement or understanding in the face of absence of consensus on a commonly defined universe of discourse of political values, law and order at the international level is of course a source of continuing anxiety on the world scene.

In the field of education, the gap between researcher and scholar and the practitioner at the local level is a well known phenomenon. Many attempts to build a universe of discourse are under way. Among the examples of the utilization of socialization processes, the example of Stephen Corey's[2] action research provides a strategy

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[1]Jeromme Bronowski, Science and Human Values: And the Abacus and the Rose, Rev. Edition, Harper Torchbooks (New York: Harper & Row, Publishers, 1965), p. 16

[2]Stephen M. Corey, Action Research to Improve School Practices (New York: Teachers College, Columbia University, 1953).

for bringing research into the classroom by having the educator become the researcher in the field.

Recent efforts to extend and improve education by means of inservice education in the unique efforts of Wayne County's Interinstitutional Innovation Workshop[1] are further instances of the recognition of the necessity of building a community of effort to effect change. The workshop brought local school teachers together as a systems group with administrators to consider an analysis of their problems and to generate solutions for them. This concept was employed to maximize the possibilities of change taking place at the local level. The targets of change in a sense became the innovative forces themselves in a mutually supportive endeavor. Four major universities and the county district staff provided the instructional leadership in a team teaching effort of unusual social reality.

Providing a universe of discourse in part is a matter of coming to terms with referrents for reality. Although the problem involves the process of defining, in

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[1]Leo Dworkin and William C. Miller, "Increasing Educational Innovations in Wayne County," Report of Title III, OE Grant #66-2479, Activities of the Chair of Innovation and the Consortium of Advanced Educational Thinking (Detroit, Michigan: Wayne County Intermediate School District, 1969).

a broader sense, the problem is a social one. Establishing a universe of discourse for the applied field of education, in effect, consists of not only institutionalizing usage, but also of enabling professionals in the field to utilize it.

Enmeshed in bewildering proliferation of research and innovation, the educator without a whole series of interdependent competencies is often unable to achieve an understanding of new developments. People trained in one aspect of education simply do not speak the same language as those trained in another.

When C. P. Snow[1] spoke of two cultures in which the scientist could no longer speak to the artist, he perceived a truth, but missed an even more obvious one. Professionally we are split into a multi-culture. As Louis Guttman observed, the condition of uncertainty of meaning of terms and the lack of a universe of discourse creates problems in the development of theory and research in the behavioral sciences:

> No uniformity of meaning appears to prevail and it is often difficult to assign a particular technical meaning even in a particular context. . . . Such a welter of

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[1]Charles P. Snow, Two Cultures: And the Second Look (New York: Cambridge University Press, 1965).

> differential usages has hardly been conducive to ease of communication between different scientists, whether in the same or different fields.[1]

Progress has been made toward utilizing a diversity of innovations, enhancing the role of the professional and moving toward the development of a clearer understanding of the social context of education.

The development of language that is functionally useful in the description, exploration, explanation, prediction and control of curricular problems is high in priority if we are to make education relevant to human problems. Work toward the establishment of a universe of discourse for the field of education is needed. Once the "universe" is established, vehicles by which avenues for change can be conceived, discussed, and explained will be readily available to all those educators who are participating in the field of education as professionals. A universe of discourse based upon selected aspects of mathematical, model and systems theory will be developed in this study to serve as the foundation for conceptual frameworks necessary to move toward the restructuring of curriculum theory.

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[1]Louis Guttman, "Notes on Terminology for Facet Theory" (mimeographed, 1959), pp. 36-37.

A New Conceptual Framework as the Basis for Change

The conceptual framework by which we interpret our daily experiences is a guide to our perceptions and actions. In large measure, it provides the basis upon which we can react to a rather large variety of phenomena and situations. It forms the means by which we can communicate with one another sharing common concerns and moving in concert when required.

The meaning of the social aspects of our being are dependent on a commonality of meaning. The checks we use to see if communication is really taking place are implicit in the adult phrase, "do you understand?" and in the vernacular of youth, "do you dig?" It is important to us as social beings to feel that we are communicating and part of the process involves the act of checking to see if we really have.

Many linguists believe that if we spoke a different language we would perceive the world in a slightly different manner. Perhaps we have no greater evidence of this than when we indeed witness some of the differences between adults' and students' perceptions.

Sharing the same language we derive a multitude of meanings from the same events or objects. We experience the world differentially as a condition of our

own uniqueness. Our orientations toward symbolic preferences and the conceptual framework we hold varies to a considerable degree.

Social action takes place in the context of a social system in which persons, both as individuals and as members of groups, interact to carry out the varied purposes of the educational organization. The curriculum worker thus functions and is part of a social system.

The ways in which we organize ourselves to provide for the educational growth of the persons in a system may be a large factor in constraining as well as facilitating learning. If for example, the preferred ways of working toward the acquisition of personal meaning in the system excludes the ways in which an individual acquires meaning, then the restrictive conceptions from which we operate form a real block to meaningful educational experiences. Change for the individual is thus related to the conceptions held, valued, sanctioned by, and implemented in the social system.

In order to create or set the conditions for change in the social system, it is necessary to communicate new experiences in order to develop a new conceptual framework. Insofar as we carefully define and perceive the world or a part of it in terms of the boundaries of its "conceptual eye-glass," we are constrained in a very

real sense to operate within its borders. If our model matches reality, it sharpens our perceptions by giving greater clarity to its form and structure. If we are committed to a model or models that are at odds with reality, then we are trapped in the rigidity of our own conceptions. Therefore in the context of change as it is here conceived, a change in the model becomes the basis of unleashing the potential of enlarged and enriched human experiencing.

The Integrative and Comprehensive Function of a Systems Approach

The major tendency in curriculum is to work on problems on a piecemeal basis. In spite of the various attempts to integrate approaches by means of core teaching, team teaching and interdisciplinary studies, the planning of change often results in the grafting of integrative approaches onto compartmentalized structures. It is unfortunately rare to see comprehensive attempts made in the planning of curriculum change at the practical or theoretical level.

As Hilda Taba suggests, "any enterprise as complex as curriculum development requires some kind of theoretical or conceptual framework to guide it."[1]

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[1]Hilda Taba, Curriculum Development Theory and Practice (New York: Harcourt, Brace & World, Inc., 1962), p. 413.

What in effect has occurred in recent years has been the production of a rich diversity of unrelated (unsystematic) ideas expressed by a variety of symbolic means. Our failure to find a theoretical means to make sense of our own innovations is now blocking our efforts to revitalize curriculum.

The means for utilizing research or even guiding it into usable direction has been impeded by our failure to make significant progress in the establishment of a common frame of reference (system). "What is lacking is a coherent and consistent conceptual framework."[1]

Much attention is being devoted to the process of change with particular emphasis on the "how." Little attention is being given to the consequences of change. Equally important is the consideration of what changes are to be sought that enable enriched experiences which mark the foundations of growth for the individual. There is a need to consider how the system of which individuals are a part affects a person and is affected by him.

To build the foundations for a conceptual framework for curriculum, it is necessary to bring together ideas from a wide variety of disciplines. There is a

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[1]Ibid., p. 413.

need for the integrative function of systems and modelistic approaches to enable the exploration of complex elements and their interconnections that comprise the social system in which education functions.

The Need for the Educators to Provide Leadership for the Use of Systems

The increasing need for education to take its place among other major institutions in the solving of major social problems requires new strategies that are capable of generating creative alternatives. In his analysis of the sources of innovation, Roland J. Pellegrin found the greatest stimuli to change in education originated in sources outside of the field of education and the local community.[1]

Education has so neglected the creative aspect of its own progress that the major contributions to its own field are now largely coming from external sources in terms of "packages" to be accepted or rejected.

The utilization of the systems approach in business, industry and governmental agencies is in a period

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[1]Roland J. Pellegrin, An Analysis of Sources and Processes of Innovation in Education (Eugene, Oregon: University of Oregon, Center for the Advanced Study of Educational Administration, 1966), p. 12.

of expansion. Because of the success of systems approaches in other organizational settings, there is a growing effort to bring it into the mainstream of the field of education.

From the standpoint of business and industry, education is increasingly viewed as a potentially fertile field for the gardening of profits. To have it so viewed may prove to be a stimulating force in the creation of a diversity of new educational materials and, ultimately, the "coming of age" of education as it begins to make use of vastly expanded technological and scientific knowledge.

The inherent danger of a business-oriented systems approach being applied directly to education is implied by the difference between the end-means relationship in which the purposes of educational development must be oriented to benefit everybody, while the function of a corporation must of necessity be structured to benefit stockholders. This statement does not mean that business interests are not cognizant of the awesome implications of becoming a controlling force in education's future and the parallel danger of alienating the professional educator. The business community after considerable investment and massive mergers of publishing,

electronic and communication industries is proceeding cautiously.

Systems development in education is coming from sources external to the field, since educators, as yet, have not provided the leadership due to lack of awareness or experience with the approach.

The major problems generated by this condition are: (1) the problem of whose systems will be in control? (2) whose purposes will the emerging systems serve? (3) are the kinds of systems being created to be oriented toward the purposes of corporate profit or people?

Because the potential effect of using a system approach in education can be productive of considerable change, it is important to develop a humanly oriented systems approach which can be used in the practice of education.

Significance of the Study

Researchers in the field of innovations, such as Everett Rogers[1] and Richard Carlson,[2] have pointed out

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[1]Rogers, "Toward a New Model for Educational Change," 1965.

[2]Richard O. Carlson, Adoption of Educational Innovations (Eugene, Oregon: University of Oregon Press, 1965).

the lack of attention given to exploration of the consequences of educational change. The difficulty of approaching the problem of anticipating the consequences of change in a system with a degree of certainty has been generally attributed to the large number of variables involved and to the general lack of models or frames of reference by which they could be viewed.

The development of model theory, and systems approaches can provide new insights for the examination of interactive relationships and furnish the resources for the generation of innovative solutions. In addition, the use of systems enables the integration of complex variables which can be examined more efficiently in process than current practice might allow.

Basically a systems approach to curriculum provides the means by which the relationships in a system can be understood and analyzed as a conceptual whole. In his search for the sources that could serve as a basis for a science of education, John Dewey expressed the major value of a systems approach.

> No genuine science is formed by isolated conclusions, no matter how scientifically correct the technique by which these isolated results are reached, and no matter how exact they are. Science does not emerge until those various findings are linked up together to form a relatively coherent system

> --that is, until they reciprocally confirm and illuminate one another, or until each gives the others added meaning.[1]

This study should be useful to curriculum workers, supervisors, administrators and teachers because it provides them with:

1. A universe of discourse and a conceptual framework with which to view curriculum as a social system. Curriculum viewed in this way can be examined in terms of its parts and their interrelationships.

2. New tools in the form of model theory (subsumed under general systems theory) which enables educators to:

   (a) Plan in terms of an analysis of anticipated consequences;

   (b) Generate creative alternatives;

   (c) Exercise choices in decision-making with a realization of options;

   (d) Build systems that are geared to humanly oriented purposes and values.

3. New ways of perceiving curriculum by viewing it as a system that can be modelled.

4. Understandings that can help educators achieve their own leadership in the use of systems.

5. A strong linkage with the social problems in the suprasystem.

6. The basis of exploring the systemic character of innovation.

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[1]John Dewey, The Sources of a Science of Education (New York: Liveright Publishing Corporation, 1929), pp. 21-22.

7. A base from which theoretical explorations of curriculum can develop.

8. A strengthened position for the curriculum generalist that is brought into focus by the realization that changes in one part of a system can effect changes in other parts.

9. A basis for experimenting with a model of the system instead of disrupting the system itself.

Since systems theory attempts to conceptualize the basic elements of curriculum and their interconnections, it covers a broad spectrum and should be useful to all educators concerned with improving the curriculum.

Design and Procedures of the Study

The major sources of information employed in this study were found in: (1) existing literature, (2) observations in school settings culled from empirical experiences, (3) conversation and dialogues with educators.

The method employed included researching and synthesizing materials from model theory, general systems theory, "educational sciences," philosophy, aesthetics, curriculum theory, communications theory and the behavioral sciences.

The synthesis of ideas from the above fields was created to provide a universe of discourse and a conceptual framework for explaining and exploring curriculum

as a social system. Models were then derived that could serve as tools for curriculum in terms of (1) analysis, (2) the development of theoretical constructs, (3) the generation of alternatives, and (4) the anticipation of the consequences of a change in the system.

Assumptions Underlying the Study

The following assumptions are fundamental to the study effort.

1. Curriculum may be viewed as a system where the term "system" is defined as a collection of elements with their interconnections viewed over a period of time.

2. It can be assumed that a curriculum is a social system composed of the generic elements of persons, processes and properties and their interconnections viewed over a period of time.

3. A model can be constructed for the social system called the curriculum.

4. Potential consequences of changing or constructing a system of curriculum can be determined by manipulating each, or combinations of the elements comprising that system without disturbing the system under consideration.

Definition of Key Terms

1. Curriculum is a social system which is comprised of the interactive elements of persons, processes and properties organized for the purpose of providing the conditions necessary for continuing educative experiences.

2. Curriculum consequence - a result or output of systemic interaction.

3. Curriculum event - a happening or act in the curriculum system.

4. Educative experience - that which facilitates growth in personal and/or shared meaning.

5. Estimation - the general process of obtaining an optimum degree of approximation.

6. Inputs - the present and future status of persons, processes and properties necessary to produce desired outcomes (performance goals) in a given system.

7. Innovation - the introduction of something new. A new idea, method, or device. The term "new" is a relative one to the extent that it: (1) indicates something of recent vintage, (2) denotes something which is generally unfamiliar to the "user," (3) designates something which is other than the former, or the old, (4) indicates something which is modern, or, finally, (5) denotes something which is refreshed, or regenerated.

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8. Isomorphism - a condition that is said to exist if there is (1) a one to one correspondence between the respective elements of two sets, (2) a preservation of certain structures essential for its identification.

9. Modalities of Inference - the characteristic method or methods of symbol mediation employed by an individual in the process of reasoning.

10. Model - a model is the isomorphism of two sets.

11. Output - the performance measures of persons, processes and properties of a system defined in terms of what is presently possible, what actually occurred and what is desirable.

12. Performance Goals - the desired outcomes of a system, consisting of physical measurements, specific skills, role expectations, normative structure differing from nonhuman systems and amenable to measurement.

13. Personal meaning - the unique aspects of individually held and understood meanings.

14. Process - a series of interdependent steps established for the purpose of attaining a goal or end.

15. Properties - the ideas or things in a curricular system, such as books, concepts, and rooms.

16. Qualitative Independence - a situation in

which an individual or group is oriented toward meaning by means of qualitative symbols only.

17. Qualitative Predominance - a situation in which an individual or group is oriented toward meaning largely by the qualitative symbolic with occasional references to theoretical symbols.

18. Qualitative Symbol - that symbol which presents and represents to the mind that which it, itself is, i.e., a particular strain of music or the color of a given object.

19. Reciprocity - a condition or situation in which an individual utilizes the qualitative or theoretical symbol with approximately equal ease.

20. Set - a collection of elements of the same kind or type identified by a common characteristic or rule formation.

21. Shared meaning - mutually held personal meanings. The basis of communication and the base from which personal meanings are generated in a social system.

22. Symbolic Orientation - the manner in which an individual employs symbols to achieve a sense of identification or awareness of a given situation.

23. System - a collection of elements and their interconnections viewed over a period of time.

24. Theoretical Predominance - a situation in which the individual or group is mainly presented with or influenced by the theoretical symbol.

25. Theoretical Symbol - is a symbol that stands for and represents something other than itself, i.e., the word "car" standing for the object "car."

Summary and Overview

In the first chapter the need for and significance of developing a systems theory approach for the reconceptualization of curriculum as a social system was developed. The purposes of the study were formulated and the underlying assumptions of the study were stated.

Chapter II focuses upon the development and explication of model theory specifically geared to building the foundation of a scientific approach to humanly oriented systems. Further, it serves to establish a universe of discourse meant to clarify the sometimes bewildering and contradictory use of models.

In Chapter III a conception of selected aspects of general systems theory is developed and important aspects of the social system such as telos, normative structure, value-orientation, and role expectations are considered.

In Chapter IV, the idea of curriculum as a social system is developed with the concepts of personal and shared meaning as a basis. Models are developed and derived to explore selected aspects of the systemic character of the curriculum.

In Chapter V the implications of considering curriculum a social system are explored and recommendations for further study are developed to suggest new and needed areas for research.

CHAPTER II

MODEL THEORY

Models: Their Isomorphic Foundations

Considerable efforts are under way in a variety of disciplines to generate new means to foster improvements in their respective fields. Among these means are models and systems theory. Although they have been introduced in education, these approaches have had relatively little impact in general practice and have tended to produce a certain amount of confusion in particular aspects of educational theory. The notion of a model and systems theory, if it can be appropriately linked to the human aspects of curriculum improvement, seems to offer new insights that are worthy of exploration.

Models have been variously defined as non-representational, which is impossible; metaphorical, which is only one aspect of its meaning; abstract, which is only part of the truth. Definitions have labelled models as copies and some writers have criticized the model because it fails to be the same as that which it represents. Some viewpoints stress the role of models as exemplars and have been criticized by those who

believe that the model is constructed as something that must be tested.

The available literature about models, a major component of systems theory, presents a bewildering array of conflicting usage and definitions. Thus, it is necessary to clarify their meaning so that they may be applied in the formulation of conceptual frameworks for curriculum.

A model as defined here, is to be considered as one of two sets found to be isomorphic to each other. To understand this particular usage of the term model, it is necessary to explore the concept of the isomorphism of sets and its inherent processes. Isomorphism is defined, or said to exist, if two conditions are satisfied:

1) if there exists a one-to-one correspondence between the respective elements of the two sets, and;
2) if certain structures of the sets are preserved.

A set is defined as a collection of elements of the same kind or type identified by a common characteristic or rule of formation.

In the context of the previous definition it is possible to say that to reach out for the stars--to sing a song--to cross the street--to solve a problem, man

makes use of models. In his attempt to articulate or grasp the meaning and form of consequences or ends, he builds constructs (sets) that he believes to be isomorphic to the set of elements he perceives. He then manipulates the models (sets) to reveal insightful estimates of the how and what of future states of affairs of the perceived set. A boy playing the guitar, searching for the right combination of notes and rhythms, is engaging in a quest for the appropriate model. He is matching the set of sounds to a conception (set) or framework almost as if he were placing a fragment of a puzzle in its proper place.

In the recent dramatic flight of Apollo 11 to the moon, extensive use of models and systems analysis were necessary. Prior to the flight, each system was checked by tests on simulation models. Confidence in the ability to judge the outcome or series of consequences involved was high not only to protect the investment of public funds but more importantly to insure the lives of its human cargo. Although models are not exact replicas of the systems they represent, the most effective ones are those that by careful definition establish a more precise isomorphic relationship between the sets involved than those found to be less effective.

Heinrich Hertz, a nineteenth century physicist,

comments with clarity on the conditions referred to here as the isomorphic relationship. He notes its basis in experience as follows:

> We form for ourselves images or symbols of external objects; and the form which we give them is such that the necessary consequents of the images in thought are always the images of the necessary consequents in nature of the things pictured. In order that this requirement may be satisfied, there must be a certain conformity between nature and our thought. Experience teaches us that the requirement can be satisfied, and hence that such a conformity does in fact exist.[1]

The notion of an isomorphic relationship is also present in Dewey's work; it is in the correspondence of ideas and practices, ideas and ideas, and practices and practices that Dewey saw a basic methodology (possible isomorphic relationship) for the clarification of meaning.[2]

The establishment of the isomorphism of two sets is dependent on the perceptions of the individual defining the condition. In this context, models are defined on the basis of selectivity. Their construction necessitates the careful choosing of their basic elements along with their

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[1]Heinrich Hertz, The Principles of Mechanics, trans. by D. E. Jones and Walley (London: Macmillan and Co., 1899), p. 1.

[2]John Dewey, Experience and Nature (New York: W. W. Norton and Co., 1929).

interconnections. Although all the possible elements of one set that might be represented in its model need not be included, as far as one is able, the elements should be so abstracted so that the model represents the crucially important features of the system under consideration.

Besides simplification and abstraction, Hertz indicates another important feature of models is their manipulative ability in relation to time.

> When from our accumulated previous experience we have once succeeded in deducing images of the desired nature, we can then in a short time develop by means of them, as by means of models, the consequences which in the external world only arise in a comparatively long time, or as the result of our own interposition.[1]

The theory of model construction performs the useful function of attempting to unify the phenomena that are encountered in the empirical world. Bits and pieces of reality, and sequence in time, fail to give us a clear notion of their interconnections and relationships until some structure or frame of reference is formulated to bring them together as a cohesive whole. The basic process involved in forming a model is that of engaging in reflective imagination. Providing the base for richer

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[1]Hertz, The Principles of Mechanics, p. 1.

experiencing, models also furnish the frames of reference for further observation and analysis and ultimately invoke the means by which the model itself can be changed.

One of the highly productive means of planning utilized by groups is the construction of a "straw man." The strategy employed is to attack critically the (model) "straw man" at every vulnerable spot and in so doing extract what is desirable to formulate a new model. One humorous example of this technique is utilized effectively by the philosopher, Nathaniel Champlin, when he asks his readers to consider the meaning of learning and pragmatism. In this case, a model is built that is deliberately isomorphic to an absurd conception of learning.

> Learning is the manifestation of the emotional strain between the orbit of Mars and the gold holdings of England and France during any given fiscal year as they are caused by the mutation of genes in the Declaration of Independence.[1]

Man attempts to solve problems and explain phenomena in terms of models. Curriculum theory, as yet, is considered to be in its early stages of development. In the context of the present study, the theory of models

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[1]Nathaniel Champlin, "Methodological Inquiry and Educational Research," A Seminar in Art Education for Research and Curriculum Development (University Park: The Pennsylvania State University), Cooperative Research Project No. V-002, 1966, p. 300.

and systems analysis are used to provide a universe of discourse that has the capacity of adding new perceptions to the field of curriculum theory. The development of this type of curriculum theory permits a flexibility in analysis, evaluation, construction and development of educational programs and offerings not possible in terms of current approaches.

In order to bring further clarity into the centrality of the isomorphic relationship to model theory, it is necessary to explore the range in which isomorphism is possible.

The search for truth in science and art, is an example of trying to find an isomorphic relationship between the findings of these areas and selected aspects of reality. When something is found to fit poorly, a new search is undertaken to find something that fits better.

The Michaelson-Morely experiments demonstrated that the speed of light remained a constant no matter what the direction of light. Albert Einstein noted a contradiction in the conception of ether held in accordance with Newtonian mechanics. The cornerstone of modern

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[1]Albert Einstein, The World as I See It (New York: The Wisdom Library, 1934), pp. 28-39.

physics emerged in a search for isomorphic relationships between phenomena (sets) under consideration and sets of rational concepts (words and numbers) to express these phenomena. Thus, the creative revolution in modern physics can be said to have begun with a search for new models to explain and explore the physical phenomena observed in nature.

By using the idea of "limits" borrowed from calculus, an isomorphism can be considered to exist between two conditions: (1) the ideal and (2) the non-related.

An ideal condition is defined as a condition which is an imagined or arbitrarily defined perfect state of affairs. In geometry, the referent "point" is defined in terms of a dimensionless position in space having zero diameter. Engineers make use of a state of "zero friction," although no moving parts can be said to exist or be found to match this condition empirically. In this frame of reference, deviations in actual particular instances are understood as departures from an ideal condition.

Although agreement upon the nature of description of an ideal teacher may not be easily reached, it is at least conceivable that many of our judgments of teachers are made on the basis of comparisons with an ideal.

When the behavior of a student is isomorphic to a concept of "ideal student," the student is labelled,

defined, or judged to be "good." No matter how distorted the particular definition held might be, the ramifications for the student, so considered, can be quite significant.

The partial isomorphism can be a powerful wedge in the understanding of humanly organized undertakings. The critique applied to the use of models by many authors points to the lack of complete isomorphism. If an isomorphism is regarded as perfect copy, we are in the position of thinking a hammer is a whole tool box and the criticism is indeed justified. On the other hand, to consider a hammer to be valueless because it is not the whole tool box is equally short-sighted.

What is missing from this modality of criticism is the value of drawing sharply defined distinctions to enhance our comprehension with the clarity of the character of the isomorphisms claimed. Using the idea of "limits," it is possible to conceive of isomorphism as ranging between ideal and non-related. Everything in this range can be considered to be on a continuum that defines the isomorphic precision represented or sought.

Using the idea of "range," the categories ideal, isomorphic, partially isomorphic and non-related can be established to indicate a continuum of possible relationships. From this simple classification system, it is possible to examine structures or models in a useful

manner with a more precise understanding of both areas of similarity and difference. The error of misconceiving an isomorphism is considerably lessened when the value of partial isomorphisms is realized as both heuristic and analytic categories.

Many of the arguments about human sciences being sciences at all proceed from a model presumed to be isomorphic to the contents, e.g., concepts, factual data, principles, theories of a body of information called a science (ideal). The argument generally demonstrates that the models of physics are not the same as the models for human sciences. Conclusions following from this line of reasoning generally state that, since human sciences cannot use the models of physics completely, a so-called "perfect human science" is impossible.

Ernest Nagel by carefully interpreting a multiplicity of common models (isomorphisms) with the diversity of models used in the various branches of science and partial similarities between models (partial isomorphisms) establishes a case for the ways in which human science can be a science.[1] This of course is of more positive value than total negation of systematic investigation.

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[1]Ernest Nagel, The Structure of Science: Problems in the Logic of Scientific Explanation (New York: Harcourt, Brace and World, Inc., 1961).

Abstraction, Synthesis and Concretion

To form a model or system it is necessary to utilize the process of abstraction. Confusion in the usage of this idea and its function is widespread. As Hubert Alexander points out: "The notion of abstracting has probably produced more nonsense than any other idea where processes of thought are concerned."[1] Artists, critics and historians have tended to use abstraction to mean distant from reality and in some cases to refer to that which is not representational. Irving Sigel, a psychologist, defined "abstract" in terms of its not representing something or being just a design.[2]

To abstract is to be selective in choosing the essential characteristics of that which is under consideration.

When essential ingredients are removed from a totality the new configuration thus formed does not match the source from which it was derived. It is instead a match of the elements and structure preserved in the process of abstraction. Any part of reality is so complex

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[1]Hubert G. Alexander, Language and Thinking: A Philosophical Introduction (New York: D. Van Nostrand Co., Inc., 1967), p. 99.

[2]Irving Sigel, Design Tasks: A Test for Cognitive Organization, Merrill-Palmer Institute, n.d.

that the necessity of understanding, grasping its significance or controlling it requires simplification.

Models in general are constructed from elements that are abstracted. The one notable exception occurs when a something is to be used, as a model (as is) in its totality.

To the artist working with a reality of a profusion of forms and an estimated 7,500,000 color possibilities, it becomes a human necessity to focus and select. Thus even the most exacting representation always involves abstraction. For the scientist, Arturo Rosenblueth and Norbert Wiener explain the same process, "Abstraction consists in replacing the part of the universe under consideration by a model of similar but simpler structure. Models . . . are thus a central necessity of scientific procedure."[1]

To abstract involves selecting. It includes the focusing of attention on some selected qualities, attributes or aspect of our experience. Thus to abstract from nature is to give selected attention to a portion of perceived reality. The focus on selected parts or aspects

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[1]Arturo Rosenblueth and Norbert Wiener, "The Role of Models in Science," Philosophy of Science, XXII (1945), p. 316.

while removing us from the "totality" which it represents in part, is no less real. The confusion can only come when it is compared to or expected to be the same as the "phenonological whole" from which it came.

If the totality of the universe in its awesome complexity could be understood directly in its entirety, there would be no functional purpose for abstraction. An educator working in a profusion of inputs can only focus on selected aspects of the whole at any given point in time. In helping a student, it may be irrelevant that his eyes are blue and his socks yellow.

To focus on the significant aspects of reality is to be selective in terms of choosing, among available alternatives, the essential characteristics of that which is under consideration. The elements and their interconnections are brought together or synthesized. To represent a segment or facet of reality requires the bringing together of selected elements and their interconnections. The configuration of relationships and structures that stand for "that" from which they were derived is a synthesis produced for the purpose of representation. To bring together into a whole or total is to make that which is unified <u>concrete</u>. Thus to form a model is to bring together (synthesize) selected aspects

(abstractions) into a set or new whole (concretion), which is isomorphic to the "model set."

Alexander, in his analysis of linguistic errors, explains: "That confusion of 'abstract' and 'general' is so widespread that some excellent thinkers fall into it."[1] To abstract is to be selective, to generalize, to be inclusive. He observes the similar confusion with concrete and particular.[2] Concrete refers to wholeness while particular means specific.

The emphasis placed on the clarification of terminology is intended to provide a basis by which a universe of discourse can be built. Insofar as the meanings we attribute to words remain confused, the communication or the sharing of meaning remains difficult.

Further Clarifications Concerning Model Theory

Models are often criticized for being different than the real thing. For example, it is pointed out that a map is not the same as the country. While this is true, it is equally true that the model is not that which is modeled nor is it the modeler. To criticize a model on this basis is to commit at least two kinds of

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[1]Alexander, Language and Thinking, p. 111.

[2]Ibid.

logical errors: (1) the reductionist fallacy, and (2) the categorical fallacy.

In the reductionist fallacy, one thing is explained away in terms of another that is considered more basic or fundamental. Familiar examples are abundantly available in the behavioral sciences. Sociology is explained in terms of psychology, and in turn, it is explained in terms of biology. While it is true that psychological and biological concepts are involved and must be used to explain sociological phenomena, the crucial point to realize is that they are involved as parts of a system. The reductionist error begins when the system and its various levels are ignored in terms of their own integrity and descriptions are made in terms of a single part of the system.

The categorical fallacy is simply considering two different things to be the same: to stand for something or to be a model of, is not the same as being that thing. Hence the symbol (word) "car" cannot be driven and it is not the same as the (object) "car." Nor is a globe the same as the earth of which it is a model. Quite logically, in neither case, is the utility of the symbol or the model in any way diminished.

The reality of the model (set) lies in its concreteness as a new entity which is isomorphic to that which it represents.

Elizabeth Maccia carefully distinguishes between the "model of" and the "model for."[1] The "model of" is characterized by representation of an existential and the "model for" is explained as ideal or pattern for some future state of affairs. The categories in that sense are useful, however, Maccia proceeds to equate "model of" with the designation "representational" and the "model for" as non-representational. While the systems approach, used by Maccia, has logical precision, it appears that she has committed a categorical fallacy.

To be a model, certain structures of one set must be preserved in the model set and if a one-to-one correspondence between the elements exists, then the isomorphic relationship is present. To have this isomorphic relationship is to stand for or represent rather than to non-represent. To the extent that a set is non-representational, it is not a model. That is to say, the conditions of the isomorphism fail and the conditions for a model (set) do not exist. The salient points to be considered imply that the dimensions of past, present, becoming and future states of affairs locate the model in time and

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[1]Elizabeth Steiner Maccia, "The Conceptions of Model in Educational Theorizing" (Washington: Cooperative Research Program of the Office of Education, U. S. Department of Health, Education and Welfare, Occasional Paper, 62-114), pp. 3-4.

relate the selection of a model to be developed to the intent of the modeler.

In an axiological sense, a continuum from representational-non-representational could be constructed to define good-bad models. Thus, a model (set) can be located in a continuum that variently defines the degree of isomorphic relationship to that which it purports to model.

It would appear to be valuable to think of models in terms of categories that have greater powers of application such as time, purpose and type.

All models are:

1. Abstract in that they are selective.
2. Representational in that they form an isomorphism.
3. Concrete in that they are formed into a total or whole (these may be parts of larger wholes).
4. Symbolic in that they are composed of or use a system of symbols.

A Topology of Models

Because of the widespread use of the idea of models in many different fields of study, they are

described and function in a variety of ways. Names in popular usage such as "material model," "physical model," "process model," "symbolic model," "mathematical model" and others found in the literature can be classified in three basic ways: (1) iconic, (2) analog, and (3) formal symbolic.

The iconic model is a visual, auditory, pictorial or physical representation of certain parts of, or the total system under inquiry. It can be characterized as having three basic forms: (a) spatial, (b) temporal, (c) spatio-temporal combinations.

Examples of spatial iconic models include pictures, photographs, physical models. In the automotive industry, small models are made to scale in other materials to serve as a model for the actual size car. Full size models are developed in clay and wood to serve as models both for design decisions and the construction of plaster molds for die-making. Animation models of the exploded view type are sometimes employed to illustrate the relationships of hard to visualize assemblies. Plastic skins of three dimensional forms are used to locate drill holes.

It is important to note that exact representation is not the primary function of the model. The representation to be found is in the isomorphic character of the

model and that which is modeled. The usefulness of this conception of model allows the concretizing function of models to become operative. It is difficult to visualize the whole earth and the interrelations of all of its parts. The model, by selective abstraction and concretizing presentations of a globe of smaller than real size, makes this possible. In science, the educator uses models of atoms (physical isomorphisms of invisible entities) or larger than actual models of anatomical parts, i.e., the human ear.

The spatial model is particularly useful where the purpose intended is served by showing the static character of forms and the interrelationships of parts.

The iconic temporal model is characterized by its dynamic functions. It is capable of serving as a vehicle for studying change in process and time.

Examples of the iconic temporal model include video tape, television, various types of acting or role playing and motion picture photography. Any kind of sensory data that can be experienced and arranged to illuminate change in form or sequence where the experience is qualitatively predominate, or in other words where the media and message depend on sensory material, can be used to construct iconic temporal models. Thus,

the muscular formations of a speech teacher forming words can be used as a model for a student. Video tape is being used to provide models for exploration, explication and evaluation. Slow motion photography is employed to provide models for the examination of process and change in time that are difficult to observe or analyze otherwise. The compression of time in time-lapse photography is particularly useful in the formation of models for the examination of growth and process.

Spatial-temporal combinations are combinations of the iconic-temporal and iconic spatial model forms. The combination of the various forms is particularly helpful in depicting characterizations of mixed systems. Static elements requiring a high degree of specificity can be best depicted with the iconic spatial models. Change process, particularly in reference to a structural system, can be represented by means of the iconic temporal model. A combination of the two is particularly helpful in providing a comprehensive iconic isomorphic representation.

The analog model[1] results from using selected characteristics of one area of inquiry to represent

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[1]Joseph E. Hill and August Kerber, Models, Methods and Analytical Procedures in Education (Detroit, Michigan: Wayne State University Press, 1967), pp. 14-19.

another in such a manner as to maintain an isomorphic relationship between them. For example, in the early work on electrical theory certain aspects of hydrodynamics were used as analogs for considering the flow of electricity through a wire.

When a map is used to represent geologic structure, certain characteristics are substituted for others, i.e., color for geological structures. When one substitution of characteristics is used to represent another isomorphic set of characteristics according to certain rules of transformation, an analog model is created. A map constructed according to this plan becomes an analog rather than an iconic representation.[1]

Man has explained his world by a number of different models. In the classical model of mechanism, the world was considered to be a perfect clock wound up by the master clockmaker (God). Medical books gave explanations that proceeded by describing body functions and structures substituting the machine characteristics for human ones. To a very great degree, much of the same kind of model is useful in the treatment and development of life saving ideas. The pacemaker, an electronic device that provides a mild electrical shock

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[1] Ibid.

to keep the heart beating in cases where the patient's neurological "mechanisms" can no longer provide the impulse, is a concrete example.

Newton's scientific formulations of gravitational astronomy were referred to as celestial mechanics. They were highly successful in predicting the movement of the planets, yet as Karl Deutsch explains: ". . . the classical notion of mechanism is a strictly metaphysical concept. Nothing completely fulfilling these conditions has ever been on land or sea . . . [or] among the stars."[1] The recognition of the interdependence of parts and the interaction of parts and the whole with environment becomes increasingly important with the sophisticated inventions of today's world. Thus, the pacemaker becomes a part of an organic system, subject to being affected by and affecting the processes of that system.

A unique example of the use of analog models was made by Robert Fox[2] in helping participants evaluate their own group's processes in the Wayne County Intermediate School District's Innovation Workshop. Team

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[1]Karl Deutsch, "Mechanism, Organism, and Society: Some Models in Natural and Social Science," Philosophy of Science, Vol. XVIII (April, 1951), p. 234.

[2]Robert Fox, "Staff Consultation With Team Leaders," Wayne County Intermediate School District's Innovation Workshop Report (Feb. 13, 1968), pp. 1-2.

members were asked to describe the diagram (analog) that most closely approximated the way in which their group operated. Circles were used to represent persons, while squares represented the leader. Just two of the choices are pictured below.

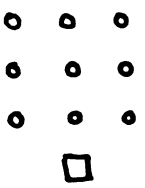

Fig. 1

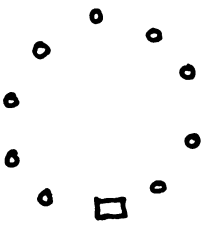

Fig. 2

In the group characterized by Figure 1, the leader is separate from and dominates the group. In Figure 2, the leader is a part of the group. It is easy to see how changes in the group process and structure can be manipulated to estimate consequences in the empirical domain, given the idea that the model is an analog of the "real" situation.

For example, remove the formal leader and split the group as in Figure 3. Let the letter P represent one opinion held by persons and the circles represent a conflicting opinion. The analog now is isomorphic to a situation of conflicting viewpoints. Manipulations of the model may suggest some avenues of change. For

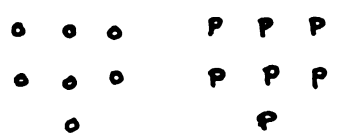

Fig. 3

example, in Figure 4, let a dotted line represent interaction and a line with a double arrow represent a sharing of opinion. It can be seen that a restructuring of the model can be suggestive of changes in the empirical domain.

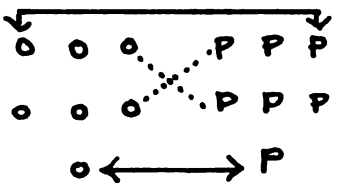

Fig. 4

Another model originally developed by Kurt Lewin was used to help groups analyze progress toward goals.[1] Using the basic idea of "quasi-equilibrium," team leaders employed the following analog to analyze and devise strategies for change toward effective goal realization.

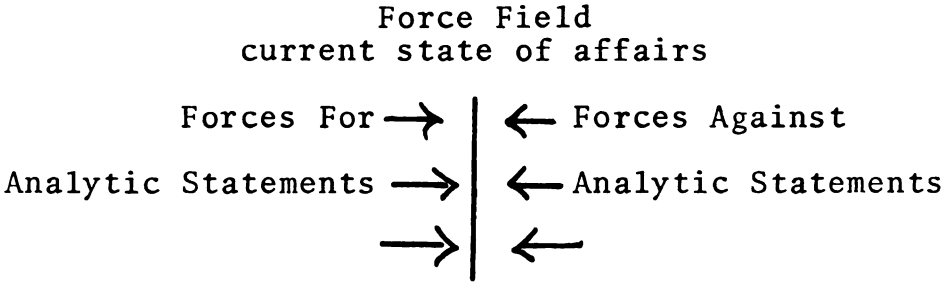

Fig. 5

In Figure 5, movement toward a goal can be presented and an appraisal made for any given point in time. Altering of forces in the model can give clues for change in the group situation. It is apparent that

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[1] Ibid., p. 2.

changes in a model are more readily and easily achieved than changes in the actual human situation. This factor is precisely the advantage that models offer in planning with foresight for application to the more difficult area of reality.

If scoring were added to the analog model, it would then utilize the arithmetical features of the formal model to predict or estimate with greater accuracy the direction and force involved in the realization of a given goal.

In addition to its verbal form, the analog model often takes the form of a flow chart, diagram or a graph. While it lacks the precision of formal symbolic models, it is useful in predicting and inferring changes in dynamic and/or complex systems. The relative ease in terms of time and expedience with which analogs can be used makes them particularly valuable for work related to human situations.

The formal symbolic model is a representation which employs a symbolic system that operates on the basis of a formula or set of rules. When the laws, theories, or conceptual constructs of a symbolic system represent the problem situation or system under inquiry in terms of the laws, theories or conceptual constructs, a condition of isomorphism can be said to exist.

Much of the empirical investigations consists of quantifying some aspect of that which is observed. The quantifications are then manipulated according to mathematical procedures and applied to the empirical phenomena.

In interaction analysis, several arithmetical methods are employed. The interactions are defined in terms of observable qualitative events and instances of these events are enumerated and summed. These summations are total scores that have the property of more than, less-than, or equal-to relationships.

In mathematical terms, an isomorphism between the set of structure of the events so viewed and the structure (set) of a mathematical model is assumed. The process of scoring, that is, the arbitrary assignment of a number to a quality or an event is used. Enumeration, that is, the specification or recording of instances are recorded (1, 1, 1. . .). The instances are added following the arithmetical model of addition and total scores for various categories are obtained. The quantified data are manipulated to compare interactions as observed according to rules that are formed by the constructs included in the model. Empirical interpretations can be substituted for the mathematical

ones associated with the model because the two sets involved are isomorphic to each other. Thus, one can speak in quantified terms, or empirical terms of less interaction, or more interaction of a defined type with mathematical precision.

The transitive relation indicated by $A < B$ and $C < A : C < B$ can be empirically translated to describe greater-than or less-than instances of a particular kind of interaction. If, for example, student-initiated interactions as compared to teacher-initiated interactions, can be shown to improve instruction as related to achievement, then an isomorphism can be established between a set of probability constructs and the set of relationship of student interaction and achievement. If this condition is true, the utility of relations that obtain in statistical manipulations of a probability set can be applied to understanding in the empirical domain and one can speak of student-initiated interactions having a greater probability of affecting achievement than teacher-initiated interactions.

Such models are frequently utilized in education and are often taken to be empirical without sufficient consideration given to the antecedents that establish them as models. The foundations for the model lie in a

model that is not in itself empirical. The mathematical model is usually taken for granted. More importantly, what is ignored even more is that the process of quantifying a quality or act is in itself a matter of human judgment.

> The aim of scientific endeavor is the discovery of the truth, falsity, or probability of occurrence of formulated generalizations about selected aspects of sensory data, or experiences. . . . Meanings in science are usually expressed as probable empirical truths based upon certain rules of evidence and verification. The rules of evidence in turn are based upon specified systems of analytic translation of qualitative symbolic information into theoretical symbolic knowledge. Therefore the ultimate goal of a science is a theoretical symbolic understanding of the qualitative symbolic phenomena included in the 'world' under examination.[1]

The problems of finding appropriate means for looking at humanly-based phenomena in terms of formal symbolic systems are particularly frustrating when the "ideal" of physics as a science is held as a model. The biologist Joseph H. Woodger describes the development of mathematics in terms of a bias directed toward the special requirements of the problems of physics. He argues that in terms of biology it may not be wholly suitable.[2]

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[1]Joseph Hill, "The Educational Sciences" (unpublished manuscript, 1969).

[2]J. H. Woodger, "The Technique of Theory Construction," International Encyclopedia of Unified Sciences, II, 5 (University of Chicago Press, 1939).

Various aspects of mathematics, in addition to probability theory, lend themselves to quantification based upon prior human judgmental operations. Set theory and empirical mapping are particularly promising in sciences involving human transaction.

Set theory has played an increasing role in social theorizing because of its flexibility and the ease with which it accommodates human judgment. A set is defined as a collection of elements of the same kind or type identified by a common characteristic or rule formation. What can be classified as a set depends on somebody deciding which common characteristic or rule they wish to employ and a judgment as to whether or not certain items to be placed in a set do have the specified commonalities. The logical power of sets rests on an isomorphism of set theory and empirical sets. "Since the axioms and theorems of set theory are tautologically true of all sets, they will also be true of the observed ones."[1] Thus it is possible to use what is known about sets to make deductive generalizations from empirical hypotheses cast in this form.

The classification of the elements of a given

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[1]May Brodbeck, Synopsis on Psychological Theories, ed. L. T. Gross (Evanston, Ill.: Row Peterson, Inc, 1959), p. 403.

set into a second set composed of at least two subsets is a process defined as "mapping."[1] Separation of children into reading groups by the color of their eyes or percentile ranks of test scores are forms of mapping.

In mathematical mapping only the theoretical symbols of abstract logic or mathematics are employed. The notation commonly employed to indicate such a mapping of Set A into Set B is: $A \rightarrow B$, where in an isomorphism of sets, Set A is called the domain and Set B, the range.

In sciences that are formed for fields of human application, i.e., medicine, education and engineering, the process of "empirical mapping" involves human judgment in the classification of elements. Thus the determination of the classification of the elements of one set into two or more "logical" categories included in the second set is a matter of someone making a decision. The process, in human terms, proceeds on a "makes-sense" or "does not make sense" basis. In addition to involving the theoretical symbols of mathematical mapping, e.g., thinking in terms of words and

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[1]Hill, "The Educational Sciences" (unpublished manuscript, 1969). The discussion of empirical mapping is based on the distinction drawn here between mathematics as a pure form and mathematics for the applied "sciences of education" as defined by Joseph Hill.

numbers, it includes the qualitative symbolic aspects of reasoning, e.g., picturing the characteristics of a problem, as well.

The concept of mapping can be employed to explicate models and their implications for the development of a "new" conceptual outlook for the solution of curriculum problems. In a very crucial sense, what can be done in education in large measure is limited to the abilities and characteristics of the persons involved.

The limitations and strengths of any humanly-oriented process are ever concerned with the development of the persons involved. Under these circumstances, the ability to employ increasingly relevant conceptual tools to the particular curricular events, becomes a necessary condition of curriculum improvement.

Summary

A universe of discourse was established based on model and set theory. The model was defined as an isomorphism of sets and the various forms of modelling were defined and explained. The model as it is conceived in this study is considered to be a construct basic to the utilization of systems theory.

It will be recalled from Chapter I that a system

is a defined collection of elements with their interconnections viewed over a period of time. According to this definition, a system is a set. Under these circumstances, systems theory is related in many ways to set theory. For example, the whole function of "modeling" a system is dependent upon the construct of the isomorphism of sets.

The elements of a model (set) of a system, be they words, numbers or pictorial representations must be isomorphic to the set of elements they represent. In this context, a model of a system can be produced, studied, manipulated and interpreted without undue disturbance of the set of actual elements (e.g., persons, processes and properties) which it represents. In similar fashion a model can be analyzed to determine the potential consequences of change or alternatives among the set of actual elements which it represents.

In the next chapter General Systems Theory and selected aspects of the social system will be explored and explained to build further foundations for considering curriculum as a social system.

CHAPTER III

GENERAL SYSTEMS THEORY AND THE SOCIAL SYSTEM

General Systems Theory

Man is a social being. He creates his perceptions of the world by means of an ongoing transaction with his environment. His perceptions influence and are influenced by the culture in which he lives. In this context he observes, figures out and speculates about the nature of the salient features of his experiences and reflects upon the way in which they are related. To the extent that man continuously defines collections of things with their interconnections, he is thinking in systems.

The notion of relationships is central to why systems approaches are useful. It enables educators to consider not only the ingredients of an educative experience, but also how they variously interact and affect each other in the process. In this sense, General Systems Theory forms the foundations from which educational sciences can emerge.

In scientific practice, thinking in systems has been refined to the point where philosophers debate about whether or not reality exists in systems or is defined by

man. In the context of this study, systems are ways in which man organizes his perceptions of the world.

One of the most significant aspects of systems analysis is that it makes possible the consideration of a complex number of variables. While the problem of doing so remains difficult at best, systems analysis provides the potential conceptual frameworks isomorphic to situations as they are found or can be developed in reality.

Von Bertalanffy found that models of classical science based on problems having two variables with linear causal chains of "one-cause-one effect reasoning" are not sufficient for understanding complex organizations (systems). Problems based on the interaction of a large number of variables require new conceptual outlooks.[1]

Stressing the focus of science on a multiplicity of variables, William Whyte explains the primacy of relationships required to interpret the facts of the empirical world.

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[1]Ludvig von Bertalanffy, "General Systems Theory: A Critical Review," The Yearbook of Social General Systems Research, Vol. VII (1962), p. 2.

> In science we no longer search for the cause for a given phenomenon. We recognize that there are always a number of factors involved. We don't try to determine which is the factor or even which is the most important factor. Instead, we try to discover how the factors fit together to produce the results we observe.[1]

Perhaps one of the most persistent difficulties in curriculum change is the tendency to proceed in a piecemeal fashion. Recent efforts to introduce change in the field of education have centered increasingly on the "so called" disciplines emphasizing the role of separate subject matters. The results of such efforts appear to be increasing unbalance and fragmentation of planning and effort in curricular endeavors.

Systems analysis focuses on planning in a comprehensive sense based firmly on the idea that change in one part of a system has the potential for affecting other aspects of the system.

Among the early efforts to use general systems theory was that of James C. Miller and his associates. Using general systems theory as a model, Miller's group generated a theory of general behavior.[2] Working from

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[1]William Foote Whyte, Pattern for Industrial Peace (New York: Harper & Brothers, Publishers, 1951), p. 189.

[2]James G. Miller, "Toward a General Theory for the Behavioral Sciences," The American Psychologist, Vol. X (1955), pp. 513-53.

the premise that there are a series of characteristics that can be identified as true of all systems, Miller defined the field as follows:

> General systems theory is a series of related definitions, assumptions, and postulates about all levels of systems from atomic particles through atoms, molecules, crystals, viruses, cells, organs, individuals, small groups, societies, planets, solar systems and galaxies.[1]

Following the implications of his definitional concept, Miller in a more recent work identified a number of hypotheses that apply in a cross-level consideration of a hierarchy of systems from cellular to international.[2] Generalizations that serve as a basis for application to any system are important in that they serve as a frame of reference for the building and understanding of specific systems.

One of the major functions of systemic approaches is to furnish a conceptual framework that is applicable to all scientific thinking. As the Blalocks point out, "Systems analysis involves a way of thinking which is common to all sciences whether explicitly recognized or

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[1] Ibid., p. 514.

[2] James G. Miller, "Living Systems: Cross-Level Hypotheses," Behavioral Science, Vol. X (1965), pp. 380-411.

not."[1] It provides a methodological basis for the synthesis of relevant variables in the examination of events of all types and a way of generating alternative solutions to problems.

Before proceeding further, it should be re-emphasized that a system is defined as a collection of elements with their interconnections viewed over a period of time. Since a mathematical set is a collection of well defined elements, a system can be considered to be a set. Further, since a model is an isomorphism of sets, systems can be modelled.

The analysis of systems considered as models under varying conditions enables the derivation of information helpful in the process of decision-making. When a system is modelled, it can be expressed by iconic, analog or formal symbolic means as explicated in the proceeding chapter in the section on the "Topology of Models."

Defining Systemic Level

When a system is under discussion as a focal point, it is named "the system." A system can be composed of smaller systems which are called subsystems. From the

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[1]H. M. Blalock and Ann B. Blalock, "Toward a Clarification of Systems Analysis in the Social Sciences," Philosophy of Science, Vol. XXVI, No. 2 (April, 1959), p. 84.

vantage point of a subsystem, the larger system of which it is a part is called a suprasystem. For purposes of clarity, the environment of a system is defined to include everything in its suprasystem except the system itself. For example, a person may be considered as a primary element in a social system such as a group. When so considered, the element "person" is a subsystem. On the other hand, a person may be considered as a suprasystem for his heart, brain, or his set of values.

What is considered as an elementary component or particle in one system is not necessarily the same when the context shifts from the micro to the macro levels of a system. An atom is considered as a basic particle which is the building block of a molecule. Molecules in turn are subsystems of elements and they in turn are subsystems of compounds. What we choose to indicate as a basic elementary particle is somewhat arbitrary, but definitely related to the inclusiveness of it as a part in a larger system.

Not too long ago, the atom was considered by physicists to be the elementary particle. With the discovery of numerous sub-atomic particles, it is now viewed as a complex system of uncertain description.

Pierre Teilhard de Chardin comments on the

astonishing network of interconnecting subsystems and suprasystems to be found in nature:

> The further and more deeply we penetrate into matter by means of increasingly powerful methods, the more we are confounded by the interdependence of its parts. Each element of the cosmos is positively woven from all others from beneath itself by the mysterious phenomenon of "composition" which makes it subsistent throughout the apex of an organized whole.[1]

In order to avoid confusion, when a system is considered as a whole, it is labelled a system even though in some other context it may be considered to be a subsystem or a suprasystem. For example, when focusing on a group of students in a classroom with a teacher, it may be considered to be a system. In the context of considering a group of teachers and groups of students in several classrooms with administrators, a single classroom is referred to as a subsystem and each person a subsystem of the subsystem.

As more and more information is discovered it becomes increasingly important to specify the systemic level that is affected in a given change process. As it becomes clearer that interrelations are systemic in character, it also will become necessary to seek systemic consequences in a whole series of levels that affect the curricular system.

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[1]Pierre Teilhard de Chardin, The Phenomenon of Man (New York: Harper & Brothers, Inc., 1959), pp. 43-44.

The Application of General Systems Theory to Specific Systems

From the viewpoint of general systems theory, every system has certain characteristics in common. One of the values of General Systems Theory is its ability to function as a resource for the formation of models for other specific kinds of systems. Recognizing this value, Bertalanffy explains:

> The existence of laws of similar structure in different fields enables the use of systems which are simpler or better known as models for more complicated and less manageable ones. Therefore, General Systems Theory, methodologically, is an important means of controlling and instigating the transfer of principles from one field to another . . .[1]

Since some systemic principles apply in a wide variety of disciplines, the resources for the reconceptualization of curriculum are greatly enhanced by the use of general systems theory.

The greater the generality of a system, the more likely it is that it can be found useful in a variety of applications. However, it must be remembered that each separate field sets the limitations by which fruitful and convenient application can occur. If the conditions

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[1]Ludwig von Bertalanffy, "An Outline of General Systems Theory," British Journal for the Philosophy of Science, Vol. I (1950), p. 142.

required by specific fields are met, then a general conceptual framework has value in a diversity of fields.[1] It must be kept in mind that the application of generalizations cannot be made to apply directly to specific systems. The isomorphic character of a system is sought so that an interpretation and a model construction can proceed with effective generalizations toward specific adaption to the requirements of a particular system.

In order to use the concepts of general systems theory in specific instances, a translation must be made to the realities of experience in the empirical world. The persons in the theoretical system must come-alive with the names, attitudes and purposes of specific people that are considered in the planning and decision-making processes.

Systemic Boundaries

The boundary of a subsystem forms the demarcation between itself and the larger system of which it is a part. Since open systems are transactive in character, the boundary serves the function of selectively admitting some inputs and rejecting others as well as controlling the

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[1]C. West Churchman and Russell L. Ackoff, "Purposive Behavior and Cybernetics," Social Forces, Vol. XXIX (1950), p. 33.

nature of the outputs. Boundaries can be natural barriers and filters such as a cell wall or the skin covering of a person. On the other hand, boundaries can be constructed physical entities such as the wall of a classroom.

In a non-physical sense, a boundary of a person or a collectivity of persons can be, among other things, the value-orientation held, the normative structure, or the way meaning is perceived. The boundary acts as a control in the matter-energy transactions that facilitate or block a selective filtering of inputs and outputs. Thus in an educational system, when a curricular event is held to be a frill, even if it may contribute to the development of human capacities, it will tend to be blocked from the mainstream of the systems activities.

Open and Closed Systems

A closed system is characterized by a finite set of variables contained within its own boundaries. It is absolute in the sense that all that must be accounted for is within the system.

Open systems, which include all living systems, are characterized by transactions with their environment (suprasystem). The means by which purpose is translated into action are called inputs, and the results of systemic interaction are the outputs of the system.

The organismic open systems theory has been the dominant system model used to generate theory involving social process. In the field of social work, Gordon Hearn[1] used the open system as a model for developing a conception of the role of social worker. He evolved the rationale for treating the social work process as a system. Basically, it was a similar transactive idea upon which John Dewey built his theory of experience.

Hearn, influenced by the work of general systems theorists, particularly that of James Miller,[2] assumed that human behavior is always the result of the interaction between the biological organism (system) and its environment.[3]

Griffiths has used the open systems model to investigate the problems of change in organizations and to demonstrate how models can be used to generate new administrative theory.[4]

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[1]Gordon Hearn, Theory Building In Social Work (Toronto: University of Toronto Press, 1958).

[2]James G. Miller, "Toward a General Theory for the Behavioral Sciences," The American Psychologist, Vol. X (1955).

[3]Hearn, Theory Building in Social Work, p. 36.

[4]Daniel E. Griffiths (ed.), "Behavioral Science and Administration," The Sixty-Third Yearbook of the National Society for the Study of Education, Part II (Chicago: The University of Chicago Press, 1964), p. 116.

The process of change in the dynamics of the open systems is accounted for in the ongoing necessity for the system to interact with its environment in order for the system to maintain itself or grow. Because systemic existence is dependent on processes of change, it is a fundamental aspect of all open systems.

The Feedback Process

Recent attention on the part of curriculum experts has been directed toward examining the function of feedback as it controls the consequences of curricular processes. The growing realization of the systemic character of the curriculum and the importance of the feedback process as evaluation and guide was of major concern in a recent publication of the Association for Supervision and Curriculum Development.[1]

The process of ordering one's future behavior on the basis of past performances is called feedback. Input energy in a system results in consequences or outputs of the system. It is the return of some of the output energy, as it is sensed and evaluated, that guides what must occur

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[1]Fred T. Wilhelms (ed.), Evaluation as Feedback and Guide (Washington, D. C.: Association for Supervision and Curriculum Development, 1967).

in the input stage of the system in order to achieve further consequences.

The conception of feedback is an interesting example of the application of human models to the design of machines. From this application, it was possible to understand feedback more clearly. What is now occurring is the application of the clarified concepts to their original source--human systems.

The idea of experience mediating further experience in terms of its directions and possibilities for further growth was clearly elaborated and developed in the works of John Dewey. Although Dewey's work is relatively unmentioned in the literature of systems theorists, both Dewey and they started with an open organic systems model. His ideas still remain as a rich resource by which the more recent systems theory can be related to a new conceptual basis for curriculum theory.

A person undergoing an experience makes sense of it in terms of what is now happening, what has happened and what is going to happen. He makes judgments, decisions and takes further actions (means) as they are necessary and desirable to achieve anticipated purposes (ends). In this context, the concepts of the theory of experience and the work of the systems theorist furnish isomorphic concepts for a theory of change based upon a theory of experience.

Feedback can be used as a means of enhancing the range of personal and shared meanings by adjusting systemic inputs. For example, if feedback is reported in terms of grades meant to indicate how well or how poorly a student has performed, the feedback functions to block further learning or at best stimulate further effort. If on the other hand, feedback provides the necessary information to provide modification of the systems input in terms of what must be done to facilitate the effective achievement of further growth, then feedback is related meaningfully to the learning process. In this sense, the feedback process as it is defined and allowed to function in a system determines what can happen to order and structure the "process of becoming" in the system. As Norbert Wiener, the cybernetician suggests, if the feedback processes are used only to criticize and control the process, it is the simple feedback of the control engineer. However, if the pattern and method of performance is changed as a result of feedback, we have a process that might be called learning.[1]

Value orientations play an important role in the determination of what is admissible as feedback. Further,

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[1]Norbert Wiener, The Human Use of Human Beings: Cybernetics and Society, Anchor Books 2nd rev. ed., 1954 (New York: Doubleday & Company, Inc., 1950), p. 61.

they serve to mediate the kind of reaction to feedback that might occur in a human system.

The Social System

It will be recalled that a system has been explained as a collection of elements with their interconnections existent in a spatio-temporal construct. The social system is defined as consisting of the generic elements of persons, processes and properties with their interconnections viewed over a period of time.

The definitions of the social system and its selected aspects will serve as the foundation for establishing curriculum as a social system in Chapter IV. Further, they furnish the source from which models of the system can be derived.

The term persons as it is used here, is considered to be the individuals and collectivities of people involved in a system. Process refers to a series of interdependent steps established for the purpose of attaining a particular goal or end. Properties are ideas or things, e.g., the contents of a course, or the room in which a class is held. In this context, a teacher (person) plans with (process) other teachers, administrators and students (persons) to develop (process) a plan (property).

Within the framework of systems theory, the selected

aspects of the social system that are developed in this chapter include: (1) value-orientations, (2) telos (purposive functions), (3) normative structure, and (4) role expectations. They are considered to be structural sub-units of the persons, processes and properties and form in part the source from which change and systemic activity are generated.

Value-Orientations

The term valuing, as employed here, refers to the methodological approach of means-ends-relationships as developed by Dewey.[1] Value-orientation as used here is defined as

> . . . A generalized and organized conception, influencing behavior, of nature, of man's place in it, of man's relation to man, and of the desirable and nondesirable as they relate to man-environment and interhuman relations.[2]

In the above sense, valuing is a process and value-orientations are properties held as symbolic meanings by persons.

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[1]John Dewey, "Theory of Valuation," International Encyclopedia of Unified Science, Vol. II, Number 4, (Chicago: University of Chicago Press, 1939).

[2]Clyde Kluckhorn et al., "Values and Value-Orientations in the Theory of Action: An Exploration in Definition and Classification," Toward a General Theory of Action, Talcott Parsons and Edward Shills (eds.), Harper Torchbooks (New York: Harper & Row, 1962), p. 410.

People behave differently because they believe different things and see the world uniquely. In education, human needs are used as a rationale for just about every kind of program. Even if the programs are the opposite in projected consequences, the same set of needs is used to argue in their behalf. Thus, ". . . beliefs about 'what is' are often disguised assumptions of what ought to be."[1]

When an adult believes he is planning according to student needs, he may wittingly or unwittingly mean adult purposes and value-orientations. This is not to deny the existence of human needs. In a psychological sense, the foundations for valuing and human purposing may rest on needs theory. However, in order to avoid dishonest ontological interpretations and confusion, it is useful to consider the curricular system as one that is constructed on the basis of value-orientations and purposive functions.

Human systems are affairs that involve making choices that are translated into behaviors which are responsible factors in generating results or consequences. Since all human systems involve the making of choices, change and action in the system is strongly related to

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[1] Ibid.

value-orientations. If curriculum is conceived of as a subsystem of human systems, it is also a system structured from and oriented toward values.

When we seek to operationalize something whether it be individualized instruction, democratic climate or mechanical efficiency, we do so on the basis of our value-orientations. The nature of the curricular experience is both constrained and expanded by the value-orientations prevailing in the person and the group or larger suprasystem. Experiences are guided not only by what we do in a given situation but also by what we have failed to do.

Failure to recognize the systemic character of experience has literally wreaked havoc with our educational institutions producing, at times, unrealistic pressures upon youth and serious unbalance in the curriculum. The effect of value-orientations and the conflict of normative structures in the realm of fostering scientific creativity is particularly illuminating.

Creativity in an individual, group or society is closely related to the ability, freedom, and support to conceive new forms, frames of reference or concepts. It is intensively systemic in origin and implication. Bertalanffy believes that we created the climate by which the very values sought are subverted. He asserts that we

can never produce "Einsteins" by expediently pouring money into basic research, bright young scientists, scientific hardware and large research buildings.[1] In Bertalanffy's view, there is basically no place in American institutions for creative individuals, unless the brand of creativity is stamped with the official and approved brand.

That this is true in an area in which we as a nation are expending vast amounts of effort is attested to by Bertalanffy's assertion that freedom to choose and carry out individually valued purposes is strictly limited in American science. He further describes the direction of both applied and basic research in terms of its control by fashion and grant-giving agencies that circumscribe freedom of choice.[2]

The situation is directly parallel to the prevailing conditions in education. That which is valued is emphasized and that which is believed to be trivial, no matter how meaningful or relevant it may be to the individual, is minimized or omitted. Ironically, that which is held to be valuable is often trivialized because the

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[1]Ludwig von Bertalanffy, "The World of Science and the World of Value," Problems and Issues in Contemporary Education: An Anthology from the Harvard Education Review and The Teachers College Record (New York: Scott Foresman and Company, 1968), p. 249.

[2]Ibid., p. 251.

persons involved may find it to be a major deterrent to developing a desire for continued learning.

> With a knowledge of the goals and values important to a subject [person] we are in a position to make much more accurate inferences regarding the ways in which he is likely to perceive a given event.[1]

The meanings that are held by a person or a group govern his choices of alternative behaviors and set the stage for actions in the context of particular situations.

Caution must be exercised in moving from an understanding of values and the expectancy of action that follow. A man may indeed do that which he is opposed to doing for still other value-orientations. When conflicts occur in value orientations, as they inevitably do, understanding that someone has a set of values different from one's own or that one's own values are in conflict does not necessarily diminish the conflict. Ultimately, if action proceeds from a rationale point of view, it does so from a choice of alternatives that generate consequences. In a sense, it is the choosing of preferred consequences in a situational context that serves to act as the selective mechanism in the choice of one set of actions as opposed to another.

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[1]Arthur W. Combs and Donald Snygg, Individual Behavior: A Perceptual Approach to Behavior, rev. ed., 1959 (New York: Harper & Row, Publishers, 1949), p. 449.

From this point of view, one of the ongoing absurdities in education is endless talk about the objectivity of value-free evaluation. To select that which is labelled "value-free" is a choice between that which is value-free and that which is value-bound. The choosing thus in itself is an act of valuing. In addition, to focus an educational program on that which one is evaluating or to select that which is to be evaluated are acts of valuing that shape the opportunities for experiencing.

In the context of systemic relationships, value-orientations form a basis from which the persons in a system define and achieve human purposes.

Purposive Functions

Systems are characterized by an underlying "telos." They are formed and take on their shape and structure from their purposive functions. "To have a goal, objective or purpose is to have something that takes the place of the future."[1] This end-in-view as a purposive affair is a representation of the events to be achieved. They are, as Champlin has argued, symbolic affairs where a non-present (the future) through its representatives (symbols) operate in the present in a directive capacity.[2]

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[1]Champlin, "Methodological Inquiry and Educational Research," p. 313.

[2]Ibid.

In order to develop the basis for understanding and diagnosing human systems, it is necessary to formulate a conception of teleological functions and structures that is capable of defining systems in human terms. Churchman and Ackoff provide a model of teleogical functions and purposes to serve in the analysis of differences between cybernetic and social systems. The distinctions they have drawn are seen as providing the resources for models that can be useful in interpreting purposes and consequences in social systems.

The functions as defined by Churchman and Ackoff[1] include: (1) extensive function, (2) intensive function, and (3) purposive function. The extensive function is a category in which objectives are achieved by relatively invarient behavior in a wide range of environments. A clock, an electric light switch are examples of objects having no function of their own that is derived from a selection-process. Their purposes are fulfilled by unchanging behavior under a variety of conditions.

The intensive function is a category in which objectives are achieved by different behavior in different environments where the behavior is usually characterized by one type of behavior in any given environment.

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[1]Churchman and Ackoff, "Purposive Behavior and Cybernetics," pp. 33-38.

Examples are to be found in such devices as thermostats, missile systems and circuit breakers. They are distinguished from extensive functions in that they have functions of their own which require a predetermined selective differential behavior for given environments.

The purposive function is a category in which objectives are achieved by alternative behaviors even in the same environment. Human systems are characterized by purposive selection processes in which the variability of human choices is a guiding factor.

Systems that exhibit purposive functions are characterized by: (1) Conditions in which the system and its environment are not rigidly specified. They are not deterministic in the framework of a mechanistic view of the world. (2) A causal nexus of consequences that result from human choices. The persons in a human system make choices by means of selection processes. (3) Symbolic interaction. (4) The selection of alternatives. (5) Capacity to be affected by the variability of human perception. (6) The involvement of the role expectations of persons. (7) The capacity to be affected by normative structures. (8) The capacity to be affected by value orientations. (9) Behavior that takes place in a spatio-temporal framework. Since purpose involves action and

change in behavior and/or conditions, locations and time intervals are essential characteristics of the system. (10) Plasticity, in that a particular goal can be reached by a variety of routes.[1]

Purposive behavior in a human system involves: persons, actions (processes) to achieve results (purposes) that are reflected in properties (things and ideas). From this point of view, to be human involves operating in a world of alternatives which is mediated into meaning by symbolic processes and then selected or chosen from the alternative means to achieve human ends.

Normative Structure

The normative orientations refers to the system of beliefs and actions that usually obtain in a given situation. They become a guide for action as they are cast in terms of values and purposes that set the conditions for what should be done or what persons are expected to do. Normative structures are formed in the

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[1]Gwendolyn Andrew, "Criteria for Systems Models and Their Application to a Sociological Theory of Organizations," (unpublished Ph.D. dissertation, Michigan State University, 1961). In her study of the application of systems theory to understanding of social organizations, Gwendolyn Andrew identified plasticity as the distinctive criterion of teleological explanations.

complex nexus of social interaction. They are understood by means of shared meanings that take the form of consensual agreements, usual procedures and commonly held interpretations of experience.

What is possible in a social system is governed to a large extent by reference to a pervasive set of norms. The individuality of a person or the distinctness of a group grows out of the relationships between people and the normative structure.

It is precisely in the realm of normative structures that the curriculum worker can observe the limitations or boundaries that are established for what can be learned as well as the methodology of instruction. Normative structures are involved in the shaping of values and purposes. They are both shaped by them and form the foil against which we test, conform, and deviate.

When rules, laws or norms are isomorphic to the values held by a person or collectivity of persons, they tend to become the referential base from which purposes are translated into action. If the actions required by the normative structure are held to be in contrast with the value system, tension is generated in the system in the form of resistance and value-conflict.

When two groups are in conflict the definitions of their purposive-goal seeking behavior is defined in

terms of differing sets of normative structure. In order to have change take on the character of mutual purposive action, commonly held values must serve as an opening wedge.

For example, in order to cope with the widening gap between the races, which simultaneously has called for both segregation and desegregation on the part of both "blacks and whites," consensus must be sought in areas of possible agreement where alternatives are developed on the basis of commonly held values. This is often not work toward the changing of differences, but rather the search for a common ground.

The process of change is interrelated with the normative structure shared by the group. The moving from a norm to a new norm is more complicated than the simple substitution of one idea for another. It involves a change in the frame of reference within which a particular area of behavior or thinking is perceived by linkage to other shared values which are strongly held.[1]

The normative structure, in this context, becomes a model against which a proposed change must be found

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[1]Elihu Katz and Paul Lazarsfeld, Personal Influence: The Part Played by People in the Flow of Mass Communications, a Free Press Paperback (New York: The Free Press Corporation of the Macmillan Co., 1964), p. 79.

isomorphic to other important values in order for change to occur. Thus, it becomes necessary for the curriculum worker to become familiar with the structures which are change resistant and change facilitating as they evolve and change in time.

Becoming a part of a group or belonging to a group involves the sharing of the opinions, attitudes, and values that constitute the normative orientations of that group.[1] Our perceptions of "reality" are defined in the normative structure. Thus, what we define as "reality" is a function of the norms of the groups to which we prefer to belong.

Social norms are created as we interact with others in such a way as to build the basis for responding to and directing the forces of change. Being a member of a family and being a member of peer groups involves each young person in an ongoing testing of norms as decisions are weighted in favor of one group or the other.

In the Cass-Willis (1940) gang of Detroit adolescents, membership in the group required that each person demonstrate that he could effectively "roll a drunk." Nowhere in the family ethos could there be found supportive norms. Behavior running counter to the value

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[1] Ibid., p. 53.

orientations and normative structure of the family depended upon a desire to be a part of the group. The gap of understanding and control of children in both home and school in part was dependent on the shared norms emanating from available and then desired interpersonal interactions. Perhaps one of the most strategic sites for educational change then would appear to lie outside of the school. Thus, the arena from which a person derives his normative orientations, perceptions, and values is a potent force in shaping the accessibility and direction of experiencing.

Role Expectations

Generally speaking, role expectations refer to the anticipated behaviors related to the position or status one person occupies in relation to another and to the normative structure against which those behaviors are judged. In actual situations, more or less leeway in role performance is tolerated depending upon a person's acceptance by a given group. Thus, no matter how well an educator may learn his professional roles in a given educational setting such as the university, he must tune-in to the specifics of expectations as they evolve and change with respect to himself and others.

The concept of role is not monolithically lodged in a position or in an organization or group. Role expectations are fluid and require continuous reinterpretation as mutually expected behaviors change in relation to new conditions. As the participants, their perceptions and the situations change so must the adaptive or non-adaptive character of behavior become apparent.

As roles become formalized into patterned institutional expectations, they become a social frame of reference. Normal behavior as contrasted with pathological behavior is identified in terms of greater access to a wide variety of social norms as well as superior skills to function within conditions of change.[1] Each role, even if it is highly specified in a formal sense, has the necessity of response to ongoing processes of change in the system.

Role expectations combine with value orientations of self and others, purposive functions, and normative structures to form a kind of perceptual filter. This influences what a person perceives and furnishes the basis of his behavior in relation to others.[2] Because of their

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[1]Norman Cameron, "Role Concepts in Behavior Pathology," American Journal of Sociology, Vol. 55 (March 1950), pp. 464-67.

[2]Muzafer Sherif, An Outline of Social Psychology (New York: Harpers, 1948).

variety and complexity every role has personal and shared aspects of meaning that are defined variently in the process of social interaction. If a role is idiosyncratic, it is so because it is defined in terms of personal deviation from expectations that are normatively oriented.

Because the concept of role includes the behavioral patterns expected from individuals in a social setting, it is a particularly useful way in which to interrelate ideas from the psychology of the individual and the sociology of groups.[1]

The recent research led by James Coleman suggests that achievement in school is strongly influenced by the expectations a child has of his chances to succeed and by our means of institutionalizing his chances.[2]

In the earlier work of Robert Rosenthal, in order to demonstrate the "error-bias" of experimenters, it was demonstrated that rats when labelled bright or dull performed according to their labels when tests were administered by researchers who had prior knowledge of the label.[3]

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[1]Warren G. Bennis et al. (eds), The Planning of Change: Readings in Applied Behavioral Sciences (New York: Holt, Rinehart and Winston, 1961), p. 349.

[2]James S. Coleman et al., Equality of Educational Opportunity (Washington, D.C.: National Center for Educational Statistics of the U.S. Department of Health, Education and Welfare, OE-38001, 1968).

[3]Robert Rosenthal, Experimenter Effects in Behavioral Research (New York: Appleton Century Crafts, Inc., 1966).

The research reported in the much publicized Pygmalion in the Classroom is an extension of this earlier brand of experiment that has been designed to demonstrate that teachers' expectancy affects pupil achievement.[1]

Normative performance, that is the conduct of roles that acquire identifiable characteristics, stems from an elaboration of values into shared meaning. When value preferences are commonly held they form a normative structure that serves as a model. This tends to keep deviations from the model confined to an acceptable range. The range of tolerable behaviors within a given role becomes the normative orientation within which a role can be performed with acceptance in any specific situation. Because of the wide variety of individual differences, the unevenness of the process of socialization, and the uncertainties of social interaction, roles in general have a degree of flexibility rather than exact limitations.

The model operating in a social structure sets the stage for the range and character of acceptable continuities and change. In addition, it suggests the sites and strategies where new energies and efforts can be applied to guide the processes of curriculum change.

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[1]Robert Rosenthal and Lenore Jacobson, Pygmalion in the Classroom (New York: Holt, Rinehart & Winston, Inc., 1968).

Summary

The salient features of General Systems Theory were formulated and related to selected aspects of the social system. Emphasis was placed on developing a conceptual foundation for viewing the social system in terms of value-orientation, purposive functions, normative structure and role expectations.

In Chapter IV the basis for considering curriculum as a social system will be developed along with the foundations of a conceptual framework necessary to derive models for application to curriculum problems.

CHAPTER IV

CURRICULUM AS A SOCIAL SYSTEM

A New Model for Curriculum

The need and methodology for reconceptualizing curriculum in terms of systems theory have been formulated in the first three chapters. In the context of past history and current practice, two definitions of curriculum are commonly used: (1) curriculum is defined as a course of study or the content of a course; (2) curriculum is defined as all the experiences of a student under the direction of the school.

In spite of the conceptual inadequacies of the first definition, it remains the dominant view of practitioners. Some educators, particularly subject-oriented ones, operate so firmly from this position that even a textbook is sometimes referred to as "the curriculum."

The second definition, dealing with all the experiences of a student, has been praised for its flexibility and criticized for its generality and vagueness. This conception of curriculum utilized the idea of the "whole child" and was formulated upon an

open organic model with extensive theoretical foundations based on the nature of experience.

The usage of the term "whole child" has deteriorated into a vague cliché poorly understood in relation to the experiential context in which it was originally framed. In its clearly articulated usage, it is systemic in character and intent and the theory of experience retains a vital role in curricular decision-making.

That some curriculum personnel have recognized the systemic character of their tasks is evidenced by the importance attached to the involvement of people in curriculum improvement and development. However, in the field of education, curriculum is not usually considered from a systemic point of view. In order to facilitate a revitalized orientation toward curriculum, it is necessary to reformulate the conceptual frameworks of curriculum in terms of its systemic character.

Since a social system has been defined as being composed of the generic elements of persons, processes and properties and their interconnections viewed over time, and curriculum is isomorphic to this model of the social system, curriculum can be considered to be a social system.

Because a distinction must be drawn between curriculum as a social system and other social systems,

it is useful to include educative experience as the differential feature.

Having defined a set, the isomorphic basis of models, general systems, social systems and the major elements of curriculum as a social system along with its distinguishing characteristics, a definition of curriculum can be constructed to serve as a model for a new conception of curriculum.

Synthesizing selected elements of the above components of systems and curriculum to serve as a model set isomorphic to the set constructed here, curriculum is defined as a social system which is composed of the interactive elements of persons, processes and properties and organized for the purpose of providing the conditions necessary for continuing educative experiences.

The purposive function of the curriculum system is centered in achieving various states within the system which are facilitative of the kinds of experiences that lead to growth on the part of the persons and elements of the system. In this context, while the focus may be centered on students in the school, educative experiences may be necessary in other parts of the system in order to affect the experiencing of youth. Thus, to the extent that the larger social system affects the

educative experiences available to its constituents, the solutions and conditions that must be changed may lie outside of the immediate doors of the schools. In this sense, some of the sites for change are to be located in the elements of the suprasystem and their relationship to the curricular subsystem. To have impact on social problems where, for example, the difficulty is related to the value-orientation of persons and their set of processes, properties and their interrelations, it is clear that change strategy cannot be directed wholly to the school population.

Educational leadership has been adept at dealing with the larger community or suprasystem by means of public relations processes. This has been particularly true in the continual search for funds in local millage elections. When the problem is restated so that curriculum as a social system functions in terms of providing the conditions for a continuing educative experience for all, the public relations approach becomes superficial and inadequate to the demands of the task.

When curriculum is considered to be a social system, it is uniquely different than the common conception of curriculum defined as a course of study or as all the experiences of a student under the direction

of the school. In redefining curriculum, the focus shifts to the relatedness of persons and to what happens in a system as well as to what can happen as a result of changes in the relationships of all of a system's elements.

While the persons, processes and properties of a system are separable for reasons of analysis, they constitute a whole interactive complex in which persons play a vital role. In this sense, the properties of a curriculum system can be considered to be products of human interactive processes. Thus buying a book, reading a book or adopting a textbook in the curriculum system are decisions that have been influenced in our interactive relationships.

Personal and Shared Meaning: Their Interrelationships

Since the energies that mobilize systemic activity are mediated into meaning by persons, personal and shared meanings offer insight into the nature of the curricular system.

The functional theory of mind and self as developed by George H. Mead,[1] John Dewey, and Norman

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[1]George H. Mead, Mind, Self and Society (Chicago: University of Chicago Press, 1934).

Cameron[1] is particularly helpful in establishing a basis for overcoming the numerous dualisms related to the concept of self and others.

To be a self is to participate in a human setting in which the uniqueness of self can emerge. Thus "selfness" is an emergent quality which is formed and developed in relation to interaction with others. Conversely, others (persons) form their "uniqueness of self" through the medium of interaction with unique persons. The emergence of self is in essence a social affair.

Because "selfness" is a social affair, the treatment of individual difference apart from the social system in which it is nurtured is a myth. If we have no common basis for shared meaning because we perceive things differently, as indicated by Earl Kelley,[2] then uniqueness of a self which achieves personal meaning is an impossibility. The self which achieves personal meaning does so in a complex of human interaction. Where this is not true, for example, in the development

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[1]Norman Cameron, The Psychology of Behavior Disorders (New York: Houghton, Mifflin and Company, 1947).

[2]Earl C. Kelley, Education for What is Real (New York: Harper Bros., Inc., 1947).

of the human neonate either pathology or death results. In Mead's terms, the social process of experience is to be considered as prior to the existence of mind in order to explain its emergence as self.[1] Thus the emergence of that "uniqueness" that we call self stems from and is forged in the processes of shared meanings.

It is out of the common fabric of shared experience--its limitless variety, its infinite capacity for differential interpretations--that the uniqueness of self emerges. That we are unique does not imply that we have no common basis in being, but rather that we share the basis from which our personal identities can emerge.

The processes of continuing to be and becoming are essentially biosocial affairs. As explained by Philip Phenix:

> To be is to be in relation. There is no such thing as absolute solitary existence. The very concept of isolation has significance only against a background of others from whom one is separated. Separateness is relative nonbeing.[2]

Meanings are in People

The "bucket" theory holds that communication

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[1]Mead, p. 50.

[2]Philip H. Phenix, The Realms of Meaning: A Philosophy of the Curriculum for General Education (New York: McGraw-Hill Book Company, 1964), pp. 195-196.

exists when there is a transmission of ideas (symbols) from one individual to another. It assumes that the meaning is lodged in the symbol and that the most important aspect is sending clear messages. David Berlo, in rejecting this position, explains that communication theory does not accept the idea that reality is either discoverable or external to human perception.[1] ". . . The human being is an active participant in the processes that create meaning or construct reality."[2] Meanings, in this frame of reference, cannot be said to be found in symbols, but rather are to be located in the mediation of the symbols into meaning. Thus, there are no right meanings for a symbol; there are only the meanings that people formulate on the basis of the way in which they perceive the world and process these perceptions into meaning.

The process of attending to and deriving meaning from an experience differs substantially from individual to individual. It is illuminating to realize that a point that one wishes to make is not, in effect, the same point to each listener, reader or student. Yet, to

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[1]David K. Berlo, "Communication Theory and Audiovisual Education," Audiovisual Instruction, Vol. VIII (June 1963), p. 376.

[2]Ibid.

ignore this aspect of human difference is to practice a folly of uniformity. In its extreme form, to institutionalize and grade the learner in relation to our own insensitivity to his individuality may be to doom him to failure in a system that values the tokens of accomplishment more than the facilitation of growth. On the other hand, to ignore the similarities in the interactive processes from which the "uniqueness of individuality" emerges is to close the door on building a common bond from which our humanness develops. Thus the problem of attending to individual differences must involve a unified conception of personal and shared meanings.

Cultural norms are not eternal givens. Although they may have the appearance of permanency, they emerge and are transformed in the context of social experience. When shared meaning extends to a collectivity of persons and the meanings are held in common as values, a cultural norm is established.

If the normative structure of an institution operates in such a way as to restrict the requirements of an educational task to a range of personal meaning styles that do not match a particular student, then his possibilities for self-actualization are restricted. The opportunity for limited achievement of personal

meaning may indeed truncate the development of shared meanings between student and institution. This in turn becomes the ground upon which value conflict and alienation are fostered.

Differential Symbolic Orientations

Attention increasingly given to the personalization of instruction, particularly as the focus of current innovative attempts, attests to the recognition of its importance as a curricular problem. Herbert A. Thelen aptly describes the notion of differing routes to meaning in his discussion of reading by concluding ". . . that the good teacher tailors the approach to each child."[1] Giving further insight into the specifics of this variety, he explains:

> For one child, the key seems to be phonics; for another, word study. I suspect the same thing would be found with other skills, such as writing proper sentences. It is possible that grammar is actually useful to some students, but it is most certainly a hindrance to others who learn to write prose the way a "natural" composer writes music--through having something to say and a sensitive ear that tells him when he has said it correctly.[2]

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[1]Herbert A. Thelen, Education and the Human Quest (New York: Harper & Row, Publishers, 1960), p. 82.

[2]Ibid.

In his exploration of creative thought processes, Jacques Hadamard notes a curious divergence of opinion about whether or not it is possible to think without words. Max Muller, the famous philologist and orientalist, asserted that thought was impossible without words, but the philosopher George Berkeley was convinced that words were a great impediment to thought. Francis Galton, geneticist, maintained that his thoughts were never accompanied by words until he went through a process of translation which he found difficult. Heinrich Hertzler, physicist, denied the possibility of thinking without words, and Albert Einstein described a decidedly different viewpoint.[1]

In the study conducted by Hadamard, Einstein responded to a questionnaire concerning the nature of his thought processes. Einstein's reply by letter indicated that words as they are spoken or written did not seem to play any role in the creative aspects of his thought process. He explained that "the psychical entities which seem to serve as elements of thought are

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[1]Jacques Hadamard, The Psychology of Invention in the Mathematical Field, Dover Edition, 1954 (New Jersey: Princeton University Press, 1945), pp. 67-70.

certain signs and more less clear images which can be voluntarily reproduced and combined . . ."[1]

He indicated the elements were of visual and muscular type. When words intervened at a secondary stage they were auditive and had to be sought for laboriously.[2]

It becomes clear that men do indeed think by different means. Also it is evident that men who are dominated by verbal patterns of thought find it difficult to believe or conceive of differences in other peoples methods of mediating symbols into meaning.

The problem of enhancing personal meaning and broadening the base of shared meaning is not only one of acquiring information, but more essentially that of developing the means to make use of an increased range of qualitatively different symbolic modalities.

Curriculum and Meaning

Men live in and are part of social systems. The process of becoming is a matter of achieving personal meaning by means of experiencing in an existential

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[1] Ibid., Appendix II, pp. 142-143.

[2] Ibid., p. 143.

social reality. The curriculum viewed as a social system exists in order to provide the conditions that facilitate the continuing educative experiences of the persons it is structured to serve.

In order to carry out the above purpose, it is necessary for individuals to have symbolic skills and capacities that are commonly held. "Even the most elementary communication is not possible without some degree of conformity to the conventions of the symbolic system."[1] In this sense, shared meaning is a normative orientation to a shared symbolic system which functions in human interaction. On the other hand, personal meanings are the source of the uniqueness of self and a potential resource for the personal meanings of others.

To achieve some degree of shared meaning, an isomorphism of personal meanings and the social intersection of value orientations, purposive functions, normative orientations and role expectations are necessary. In this sense both the achievement of expanded personal meaning and shared meaning are linked to curriculum viewed as a social system.

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[1]Talcott Parsons, The Social System, Free Press Paperback Edition, 1964 (Toronto, Ontario: Collier-Macmillan, Ltd., 1951), p. 11.

A Model of Symbolic Distance

As it has been noted, meanings are in people and they exist in two basic forms: (1) personal and (2) shared. The curriculum system, as considered here, exists to provide for continuing educative experiences as they are variently defined by individuals and the collectivities of persons who form a basic part of the system.

Where there is failure to create the conditions necessary to achieve continuing educative experiences, a condition of symbolic distance can be said to exist. For example, if the symbolic modalities being employed to provide experiences for students are significantly different from the personal style of deriving meaning on the part of the student, a condition of symbolic distance can be considered to exist. The greater the symbolic distance, the less a student can be expected to derive meaning from a given curricular event.

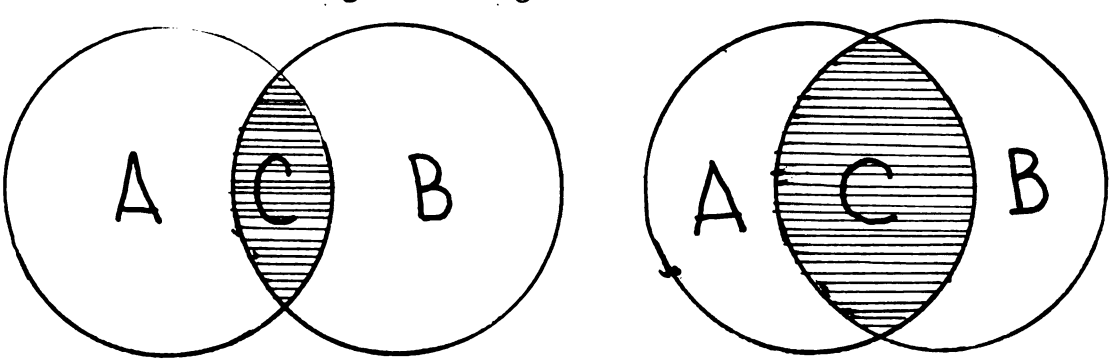
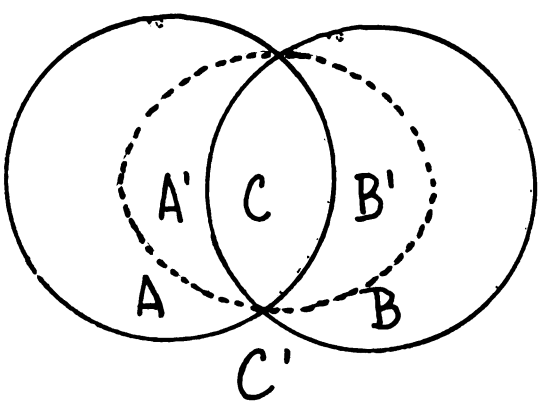


Figure 6.--Model of Symbolic Distance

In terms of set theory, if "A" represents the student's personal meaning style and "B" represents the style employed by the teacher or the discipline in a given curricular event, then the area of shared meaning "C" defines symbolic distance in terms of increasing or decreasing possibilities for experiencing. As the area of "C" increases, the shared meaning increases and the symbolic distance decreases in relation to its previous state.



A' represents the set of expanded meanings of the pupil; B' represents the expanded set of the teacher; and C' represents the expanded set of shared meanings, or the set containing A', B' and C.

Figure 7.--A Model for the Expansion of Shared Meaning.

It can be seen by simple inspection that the problem of enhancing shared meaning depends on mutually held personal meanings. To enhance personal meaning, the utilization of shared meanings must be extended. The greater the range of personal meanings, the more likely an intersection of sets will take place. The intersection of sets of personal meaning indicate the extent of shared meanings.

A model of symbolic distance can be established for all of the various interactive persons involved in a given curriculum system. For example, to facilitate the operation of a system toward self-renewal, it might be useful to consider the reduction of symbolic distance among various members of a staff. After diagnosis, inservice education for a staff might be planned in terms of reducing symbolic distance and enhancing shared meanings. The reduction of symbolic distance, in this sense, becomes a change strategy designed to move the system toward improvement.

As the stage is set for improved participation and communication, the conditions for developing personal meanings are fostered. Exposure to new ideas and the experiencing of them provide the basis for opportunities to expand the range of personal meaning. In addition it becomes the base from which the potential range of shared meanings can be enlarged. As the variety of shared meaning is extended to greater numbers of persons in a social system, the potentials for the acceptance of new alternatives to the normative structure are formed.

Change and the Consequences of Change

Much time has been spent in prophecy, looking

into the future and extrapolating current trends has become a popular pastime in both educational and non-educational circles. Given a trend, the typical approach is to extend it and assume that this is the shape of things to come. The problem is not only that the predictions might be wrong, but rather that they may be right. Planning on the basis of a conceived but unknowable future has the uncomfortable feature of not rallying our efforts toward desirable alternative ends.

To ask how the world will change and to address ourselves to a curriculum based on our answers is to act with foresight while foregoing choice. The beginning of progress is the recognition of problems and the selection of alternative answers that match our conception of improving the quality of being and becoming. The important question is not what will the world be like in the future, but rather what do we want the world to become and what must be done to bring it into being.

Since we are always a part of and taking part in a social system, to act with intelligence in terms of that system is to order the means-ends relationships of the system so as to secure anticipated consequences.

To act in terms of a democratic value-orientation is to be concerned with the dignity and worth of each individual. This concern should manifest itself by the involvement of persons in the decision-making process, particularly where the consequences of decisions are capable of affecting the individual.

Systems approaches are value-neutral in the sense that they will operate from any value-orientation, hence it is important that clear conceptions of value-orientations are formulated so that normatively democratic practices and their accompanying role expectations can function in the purposive structure of the system. In terms of the above description, in order to act with intelligence in a social system, it is necessary to think systemically. To think in this fashion is to work with the systemic elements and their interrelationship so as to be productive of anticipated consequences.

Human purpose and choice direct the output of a system (its consequences). Thus, to err or not to err and to correct errors are all natural to the functioning of human systems. It is possible to choose to do all of the "wrong things" with a high degree of efficiency. Hence, the efficient error is a matter of human choice.

It is important to note that the major teleological thrust of the curricular social system is not efficiency. It is defined in terms of seeking to facilitate human growth by means of educative experiences. Efficiency is valued only as it contributes to this end. As efficiency functions as a value for its own sake or for conformity to a mechanical ideal, it becomes a threat to humanly oriented purposive functions.

Given sets of relationships in a system yield characteristic consequences. For example, if a dropout is induced to come back to school and the same systemic relationships that contributed to his leaving remain, a series of possible consequences are generated. Among the possible consequences are apathy, alienation, hostility, revolt, submission, the attempt to change himself and dropping out again. As the systemic relationships are altered to facilitate the growth of the individual in both personal and shared dimensions of meaning, a new series of possible consequences are generated. As we seek answers in the systemic conditions that foster the consequences that form our purposive structure, we must reconstruct the social system called curriculum.

In this sense, the curriculum is never a completed object, but rather a system in a state of change

where the focus of change is intended to facilitate educative experiences for the clients of the system.

A model of change can be developed from the aspects of the social system that affect the kinds of consequences that a system can generate. As used here, a consequence is any result or output of a curricular system. In this sense everything that happens in a system is a consequence of the system. Thus, an action, decision, event, or results are types of consequences.

In the curriculum viewed as a social system, the interactive elements of persons, processes and properties generate consequences. This occurs as they are mediated by the personal and shared meanings operating in the system. Value-orientations (V), role expectations (R), purposive functions (T), and normative structure (N) furnish a resource and act as a core from which personal and shared meanings emerge in the system.

The utilization of value-orientations (V) to anticipate behavior has been recognized by the psychologists focusing on the individual.

> Very early we recognize the crucial character of values affecting a person's behavior. This provides us with the guide lines to the behavior of others and makes

> possible a degree of prediction of what they will do.[1]

In the context of systemic thinking, V, T, R and N are always found together as they function in a social system. Because of the complexity of the social system, exact prediction is uncertain and thus requires terminology appropriate to the task. For these reasons the potential consequences of change are of two types: (1) anticipated and (2) unanticipated.

A curricular event is a happening or occurrence in a curriculum system. In this sense, it arises out of interactive elements of persons, processes, and properties of curriculum considered as a social system. It will be recalled that a process was defined as a series of interdependent steps established for the purpose of obtaining a goal or end. In this context, the consequences of change (curricular events) are determined by other curricular events serving as systemic inputs of the system. As an event becomes feedback it is capable of altering the purposive structure in the shaping of further events.

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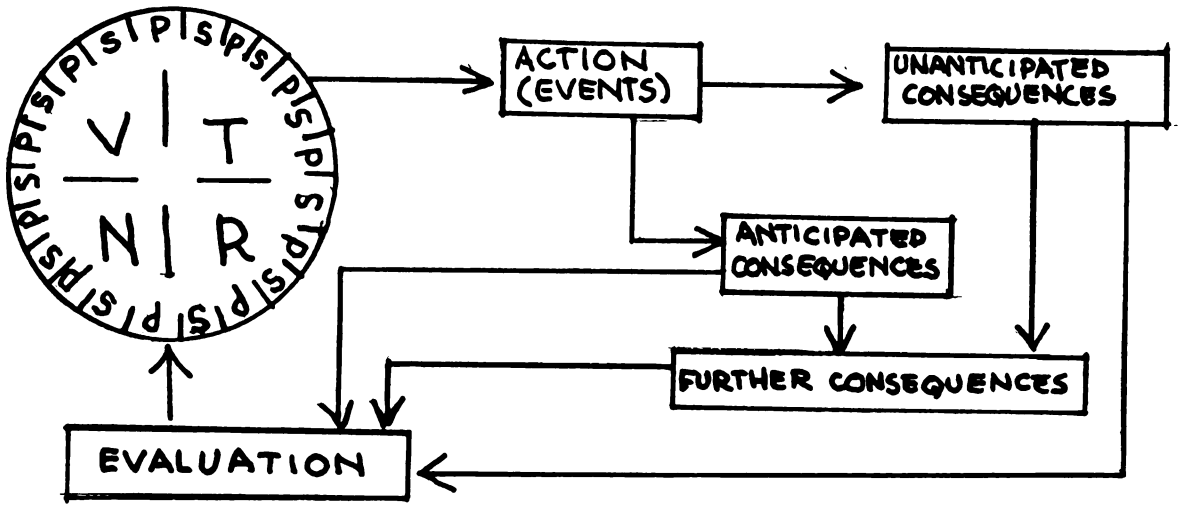
[1]Arthur Combs and Donald Snygg, Individual Behavior: A New Frame of Reference for Psychology (New York: Harper Bros., Inc., 1949), p. 105.



P = personal meaning
V = value orientations
N = normative structure
S = shared meaning
T = purposive functions
R = role expectations

Figure 8.--An Analog Model of the Change Process in Curriculum Viewed as a Social System

When consequences are generated in a system, they in turn continue to generate consequences. Some of the consequences are unevaluated, however, when the focus is on intelligent ordering of means to achieve ends, consequences become feedback for evaluation and thus influence the systemic input for new action. In

this sense, since purposive functions in relationship to V, N and R guide the choices in a curricular system, events to a large degree are created. Because a result of consequence of a curricular event can be created, it is a systemic affair to which the methods of intelligence can apply.

Polanyi sees in the basis of shared meaning the ethical foundation of truths.

> Human responsibility is subject to . . . intrinsic limitation; it can only operate if embodied in human beings who are liable to failure. For no responsibility is taken where no hazard is met, and a hazard is a liability to failure.[1]

The human mind is an emergent in social interaction. It exists only within an articulate cultural framework of society. Since access to the totality of meanings and truths are limited for each person, he must trust others for the rest. In this context the process of reliance and mutual respect is fundamental to the functioning of society.[2]

However, if we leave it solely at the level of mutual trust we have a necessary rather than a sufficient condition for establishing shared meanings. Because men

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[1]Michael Polanyi, The Study of Man, Phoenix Books (Chicago: University of Chicago Press, 1959), p. 67.

[2]Ibid., pp. 67-68.

do deceive one another and themselves, and because conflicting opinions, values and theories are held, the foundations of shared meaning emerge in response to anticipated and experienced consequences in addition to mutual trust.

The Qualitative Control of Consequences in the Curricular System

The arts offer a rich resource for mediating the consequences of curriculum events. To the extent that the anticipated consequences sought are qualitative in character, we are engaged in utilizing the methodology of art.

The artist, as he paints a picture, is thinking in terms of systems. He does so by exploring the relationships of colors and forms to that which preceded and to that which must follow in order to actualize an artistic event. Each new color and form alters the relationships in such a manner as to affect the total. This in turn calls for continued responsiveness and sensitivity of parts to parts and parts to the whole.

An artist's work like a curricular event is not only a singular event, but also a part of an ongoing series of steps or flow of development. The art of the educator is infinitely more difficult in that people

function as an active element in the system with purposes and perceptions of their own.

To choose one set of alternatives rather than another is to institute a series of consequences. To act with purposive function is to make choices that move in the direction of anticipated ends. Where the ends sought are qualitative in character a situation exists in which the control of consequences in the curriculum system can be said to depend on the "educational arts." Since all human interactions generate qualitative outcomes, curriculum can be said to be a matter of the arts.

Widespread confusion about the meaning of art has led even careful thinkers into misconceptions about the nature of their own fields. Often the false dualisms that separate feeling and thinking are invoked. It is implied that when we know, we are applying science; and when we are dealing with the unknown, we are dealing with art. If a given writer believes that we can never know certain aspects of human behavior, he tends to believe this to be the locus of art.

Daniel E. Griffiths falls readily into the trap of his own misconceptions:

> The administrator is an applier of science. . . . There will always be some art in administration, as there is in engineering

> or medicine; but the amount of art will decrease as the amount of available scientific information replaces administrative folklore.[1]

As the systemic treatment of this study indicates, education can be considered to be comprised of applied sciences. This, however, does not create a situation in which the arts of the same system are excluded.

The idea of the qualitative symbol is derived by the triadic formulations of the meaning of symbols by Charles Peirce and the conceptions of the qualitative ordering of ends by John Dewey. The meaning of a sign or representamen in Peircian terms "is a First (symbol) which stands in genuine triadic relation to a Second called its Object, so as to be capable of determining a Third called its interpretant."[2]

A quality, if it is to be considered a symbol, must have a relationship that refers to something other than itself; yet a qualitative symbol as it is defined is a symbol that presents and represents that which it

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[1]Daniel E. Griffiths, Administrative Theory (New York: Appleton-Century-Croft, Inc., 1959), p. 24.

[2]Charles S. Peirce, The Collected Papers of Charles Sanders Peirce, ed. Charles Hartshorne and Paul Weiss (Cambridge: Harvard University Press, 1932), Vol. II, p. 274.

is. In establishing the foundations for considering a quality a symbol, Nathaniel Champlin explains, "A specific quality is the result or product of a relationship of qualities, one of which is itself."[1] The relationship is triadic and meets the conditions for being a symbol by being: (1) a specific quality; (2) the product of a discrimination (something other than itself), and by (3) standing for or representing the relations in which it is presented.

John Dewey recognized the methodological importance of the qualitative ordering of events when he said:

> The doing and doing and making is artistic when the perceived result is of such a nature that its qualities as perceived have controlled the question of production.[2]

Each educational task has its own unique symbolic requirements. Each individual has his own personal style for mediating symbols into meaning. When the requirements for learning a given discipline or subject matter are at odds with an individual's way of

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[1]Nathaniel L. Champlin, "Methodological and Educational Research," p. 318.

[2]John Dewey, Art as Experience (New York: Minton Balch and Company, 1934), p. 48.

deriving meaning, the chances of success are greatly reduced or even impossible. Modifications in the approach to a discipline can be altered to facilitate learning. In this sense, new math or old math are neither better or worse as approaches, but rather differentially accessible for the derivation of meaning according to the learner.

Two major symbolic forms exist: (1) the theoretical, (2) the qualitative. The theoretical symbol stands for something other than itself; i.e., the word car stands for the object car. The qualitative symbol presents and then represents itself. In the main, educational experiences have been designed around theoretical symbols as if the qualitative dimensions of meaning did not exist. This can be observed even in music classes which are predominately qualitative in character, particularly where the child who wants to play by "ear" is discouraged. To the extent that there is a dysfunction in the symbolic orientation of the person and the task, a condition of symbolic distance can be said to exist.

A Model of Symbolic Orientation

The symbolic conditions of an educational task

can be modelled in terms of the symbolic relationships as developed by Francis T. Villemain and modified by Nathaniel Champlin. The four relationships are:

(1) Theoretical predominance, a situation in which the individual or group is mainly presented with or influenced by theoretical symbols. The study of philosophy or math are predominately theoretical. As Champlin points out, theorizing takes place in a qualitative setting such as a room, laboratory or collection of attitudes. In this context, qualities can be controlled to facilitate qualitative states desirable for achieving theoretical predominance. For instance, a room conducive to setting and an atmosphere that facilitates attentiveness is helpful for the lecture; while an informal setting in which the furniture can be rearranged is desirable for group discussion.

(2) Qualitative Predominance is a situation in which the individual or group is oriented toward meaning largely by means of the qualitative symbolic with occasional references to theoretical symbols. Drama is a case in point. Theoretical symbols in this context are useful as they help to achieve qualitative states.

(3) Reciprocity is a condition or situation in which an individual utilizes the qualitative or theoretical symbol with approximately equal ease. The Group

Process or Workshop Ways of Learning are examples where both the ordering of qualities such as informality and cooperation are as important as the words exchanged.

(4) Qualitative Independence is a situation in which an individual or group are oriented toward meaning by means of qualitative symbols only. Examples are to be found in painting, sculpture, music and the dance as well as the general atmosphere in a classroom. Although there are theoretical symbolic systems for achieving qualitative ends, qualitative independence exists when qualities alone are used to achieve further qualities. The spontaneous response of a jazz musician to the sounds of another band member is an example of qualitative independence.[1]

In order to set the stage for facilitating learning, the symbolic distance generated by a difference in the symbolic modalities of the task requirement in a curricular event and personal meaning style must be reduced. The four methods or symbolic conditions can be used to define the educational tasks in terms of the learner's current symbolic orientation. In this

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[1]The model forwarded here is indebted to the works of Nathaniel Champlin, particularly in "Methodological Inquiry and Educational Research," pp. 320-322.

context, the human being and his way of achieving meaning become the starting point of an educative experience rather than the structure of the discipline.

The Concern Matrix

Since process is considered to be a series of interdependent steps established in order to obtain a goal or an end, the curricular system is a system of action or a process system. In this sense, the system can be modeled to represent curriculum events as the outcome or interaction of sets of persons and properties systemically interactive in a process system. It is readily seen that interactive complexity of the system forms a total. This "wholeness," while it can be separated for purposes of analysis, remains interactively complete in reality. For example, when water is separated into its component parts of hydrogen and oxygen, the water which is the resultant of the systemic interaction of these two elements is nonexistent. This does not negate the value of analysis, because it is a major source of understandings and control of future synthesis.

For the purposes of exploring curriculum as a social system a concern matrix (system analysis model)

of the system can be constructed in terms of the interactive elements of persons, processes and properties. To relate systemic action to anticipated consequences, the elements can be scored on an eleven point scale from 0 to 10 designed to represent the concern shown for the persons, properties and processes in a given curriculum event.

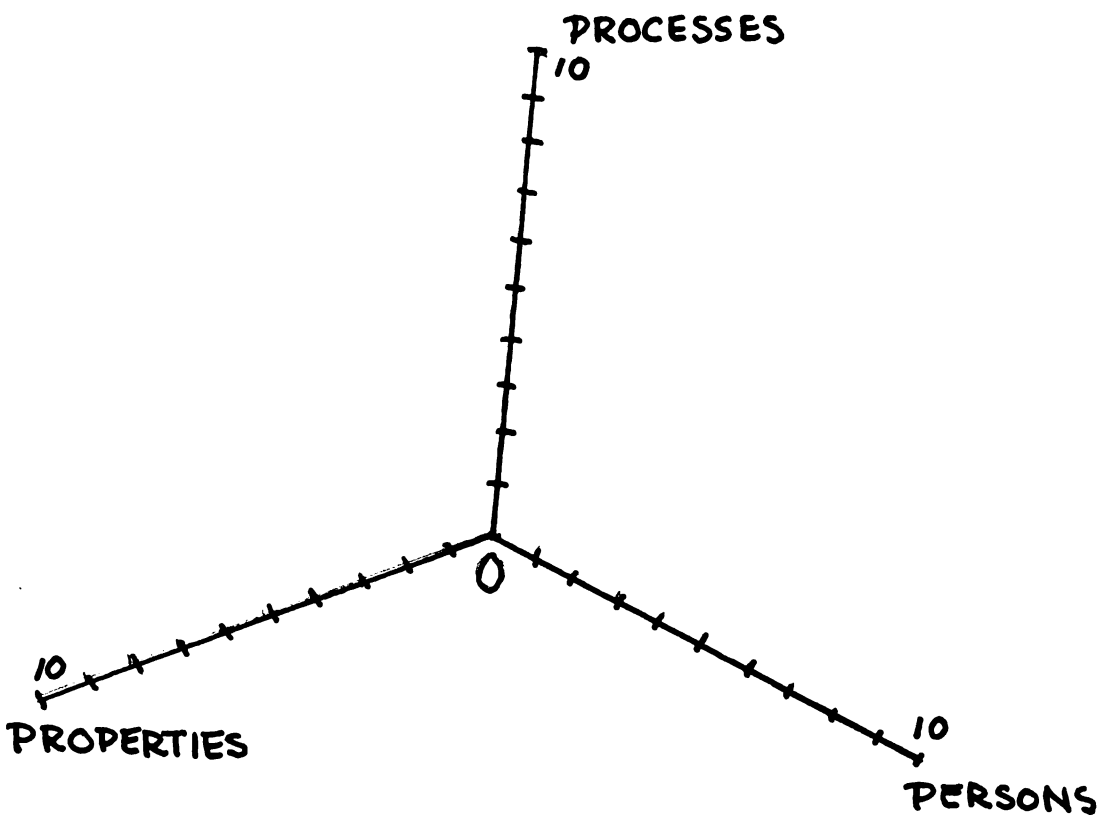

Figure 9.--A Concern Matrix for Curriculum as a Social System.

Since the elements of any system and their interrelationships are capable of affecting everything in a system, this characteristic of systems is isomorphic to curriculum considered as a social system. Change in curriculum viewed as a social system is in this sense, change in the relationships of concern for the persons, processes and properties of the system and their interrelations.

Concern in the persons element of a system is defined in terms of who is involved in the facilitation of growth in terms of personal and shared meanings resulting in the formulation of purposive functions and their implementation. The persons element consists of students, teachers, parents, administrators, community governmental bodies (board of education, local, state, national and international) and professional organizations. Concern for persons is defined in terms of the persons in the set judged necessary for the successful achievement of a given curriculum event. Failure to exercise appropriate judgment in relation to appropriate inclusion or exclusion will affect scoring on the concern for persons element.

Since the act of scoring is the arbitrary assignment of a number to an attribute, quality or act,

the process of human judgment is exercised in terms of empirical mapping. It will be recalled that empirical mapping proceeds on a makes sense-does not make sense basis.

Concern with the processes elements of the curriculum system is defined in terms of various methodological processes such as participation, communication, planning, decision-making and implementation of actions necessary to facilitate the achievement of systemic purposes. The methodological processes are related to the functional processes of instruction, operations, evaluation, educational services, curriculum development, and research. Process as it is focused on personal and shared meaning is basically a concern for persons. To show concern for process without concern with persons is to stress the methods of interaction without attending to the teleological forces as they are embodied in the personal and shared meanings of the participants. Thus a high concern for process and a low concern for persons is probably generated from an authoritarian viewpoint. An extreme example of this is to be found in an actual case where a psychology professor had students vote on two alternative methods of grading: (1) "blanket B," (2) sliding scale "A to E."

When the class voted for "A to E" grading, the vote was repeated three times until the professor's choice "blanket B" grading method was approved by the class. The process of democratic selection was misunderstood and abused, having little connection or concern for persons. Frequently, in such situations the insistence on process is done in terms of the belief that it is based on concern for persons. Judgments in each case must utilize empirical referents based upon the personal and shared meanings of persons. In the case mentioned above, the students believed the behavior of the instructor to be hypocritical or misguided ritual rather than concern for their feelings or opinions and was from their perspective a low concern for persons and a high concern for process.

The stated intent of the "blanket B" grading method was to remove the threat of grading and so induce self-motivated interest in subject matter. Since little was done to establish anything but this as a condition for facilitating educative experience, there was in subsequent events a low concern for processes.

To show concern for properties is to consider the ideas or content and the facilitating artifacts such as book, classroom, buildings, tapes, film,

computers, etc. For example, to install computers without accompanying concern for persons and processes is to focus on properties. "White elephants" in terms of unused equipment are in abundance where money facilitated purchase without necessary attention to other systemic elements.

Another example of the focus on properties is to be found in curriculum meetings where the total time is spent in the listing of books to be used by students.

Since in reality, an analysis tends to separate that which is found in a qualitative state of "wholeness" it is important to note the persons, processes and properties elements are always interactive.

A Model of Systemic Disorders

Because the Concern Matrix can be used to diagnose a complete range of systemic conditions, it is possible to generate a model isomorphic to conditions that could be regarded as systemically dysfunctional. Since concern can be scored from "0 to 11" on the Concern Matrix, a range of possible conditions can be defined as dysfunctional.

Where the scoring of emphasis on the Concern Matrix is accorded "six" or below, a systemic dysfunction is considered to have been identified. The state of a

system as analyzed by the Concern Matrix for purposes of identifying disorders are defined as consisting of eight conditions:

1. Insufficient Emphasis of the Persons Elements.
2. Insufficient Emphasis of the Processes Elements.
3. Insufficient Emphasis of the Properties Elements.
4. Insufficient Emphasis of the Persons and Processes Elements.
5. Insufficient Emphasis of the Persons and Properties Elements.
6. Insufficient Emphasis of the Processes and Properties Elements.
7. Insufficient Emphasis of the Persons, Processes and Properties Elements.
8. No Distortion of Emphasis (a score of seven or better in each of the interactive elements).

The exact nature of each consequence emanating from a curricular disorder as analyzed by matrix diagnosis can only be stated in terms of potential consequences. However, the source of systemic difficulty and recommendations for change can be readily handled by these diagnostic tools.

While the complete exploration of the systems analysis potential of the Concern Matrix is a study in

itself, certain consequences are clear when examined in light of its structure.

For example, when there is an Insufficient Emphasis of the Persons Element, consequences are generated for which other consequences should flow. One certain consequence is the failure to develop personal and shared meanings. From this lack, several further potential consequences can occur: (1) apathy; (2) no role expectations that are mutually shared and understood; (3) lack of commitment; (4) alienation; (5) hostility; (6) no normative structure to serve as a base for organizational unity of purpose; (7) value-conflict; (8) unclear or rejected purposive base.

It is important to note that since it is possible to have similar consequences (symptoms) it is essential that diagnosis proceed by using the consequences as clues only where the more exact determinates are not to be found in the systemic relationships. If prescriptive action for apathy, for example, follows, we shall be treating a psychological consequence or symptom while leaving the systemic disorder untouched. If a condition of apathy follows from a matrix analysis of 0, 7, 8 (<u>persons</u>, <u>processes</u>, and <u>properties</u>) it becomes a matter of selecting appropriate strategies to bring concern for persons into the system in order to rectify its disorder.

The Concern Matrix can serve as a diagnostic tool to analyze the relationships of the basic curriculum elements. With the addition of the Model of Systemic Disorders, it is possible to analyze systemic dysfunctions and generate means for their correction. Thus in terms of the model constructed here, it is possible to act in terms of anticipated consequences of change in curriculum viewed as a social system.

Summary

The various strands that form the foundations of curriculum viewed as a social system have been brought together to formulate a new conceptual model of curriculum. Using the concepts of set, isomorphism, model, systems and social system, new models were generated from the curricular model that are capable of providing educators with new insights for the analysis, planning, development and the implementation of improved curricular practice.

Chapter V will deal with a summary of the study in terms of (1) an overview, (2) implications, and (3) recommendations for further study.

CHAPTER V

SUMMARY, IMPLICATIONS AND RECOMMENDATIONS

Overview

To build a system is to search for meaning and order in the flux of ongoing experience. The first four chapters of this study have been devoted to a delineation of the ingredients of a new conception of curriculum based on a systems approach. In a deliberate manner, the study was constructed so that it could serve as a model and a resource for future efforts in model and systems building in addition to furnishing new material for the construction of curriculum theory.

Because of the intrinsic complexity of human systems, the attempt toward the reconceptualization of curriculum as social system must be considered a beginning. There is so much that man cannot see because he is blinded by his own preconceptions. Also, there is much that is seen that does not make sense because of a lack of a conceptual framework to provide a way toward understanding. In response to the inherent difficulties of the task, this study has attempted to

furnish the bases from which some of the complexity can be unraveled and new perceptions achieved.

The treatment of this study and its conclusions are in much the same spirit intended by George Kelly in his treatment of theory.

> The world is not an abandoned monument. It is an event of tremendous proportions, the conclusion of which is not yet apparent. . . . The truths the theories attempt to fix are successive approximations to the larger scheme of things which slowly they help to unfold.[1]

In this context, the raw material for the construction of curriculum theories is a movement toward, rather than a completed journey.

The major purpose of the study was to consider curriculum as a social system in order to formulate a conceptual viewpoint practitioners can apply to the problems of curriculum change. A secondary purpose was to develop the basis by which curriculum change could be assessed for decision-making in terms of the potential consequences emanating from change.

A universe of discourse was developed from concepts derived from a variety of disciplines. The

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[1]George A. Kelly, A Theory of Personality: The Psychology of Personal Constructs, Norton Library, 1963 (New York: W. W. Norton & Company, Inc., 1955), p. 19.

concepts were synthesized to furnish the foundation for the construction of the system. Models were then derived to illustrate how models could be generated from the new conception of curriculum. The models were derived to serve as analytic tools in the decision-making process and in the guidance of change in terms of potential consequences.

The universe of discourse consisted of concepts derived from (1) set theory, (2) model theory, (3) general systems theory, (4) social systems theory, (5) philosophy and various behavioral sciences. Using the concepts of "set," "isomorphism," and "system," a model of curriculum viewed as a social system was constructed. The model was considered to be isomorphic to the empirical referents of the concepts in the "model set" derived from the above listed sources.

The theory of models is considered to be crucial to any scientific foundation for the development of theory. Because of the importance of the concept of models, a theory of models was constructed to reduce the conflicting and bewildering usage encountered in this field.

To facilitate the use of logical constructs in humanly oriented systems the following steps were

taken: (1) a topology of models was constructed; (2) a model of isomorphic relationships based on "limit theory" in calculus was established; and (3) the concept of empirical mapping was explicated.

The process of developing a conceptual framework for curriculum requires the extensive picking apart (analysis) of selected aspects (abstraction) and putting together (synthesizing) of complex variables derived from general systems theory and social systems theory. The above tasks were undertaken as the next stage to establish further resources from which a systemic viewpoint of curriculum could be constructed. The concepts derived from general systems theory included: (1) the relationships of interactive elements, (2) systemic levels, (3) systemic boundaries, (4) open and closed systems, and (5) feedback.

Using the concept of systems, a social system was defined as consisting of the generic elements persons, processes and properties with their interconnections viewed over a period of time. Selected aspects of the social system were derived from philosophy operations research, cybernetics and social theory. They included: (1) value-orientations, (2) teleological functions (purpose), (3) normative structure, and

(4) role expectations. These aspects were regarded as a filter or referential core from which decisions and behaviors in a social system are generated.

The notion of personal and shared meanings was added to complete the necessary ingredients from which curriculum viewed as a social system could be a useful concept. The various conceptions of curriculum were explained and a new model of curriculum viewed as a social system was constructed. The model, derived from the previously established conceptual frameworks, was defined as: Curriculum is a social system which is comprised of the interactive elements of persons, processes and properties organized for the purpose of providing the conditions necessary for continuing educative experiences.

Using the new model of curriculum, as a starting point several models were derived that can serve as useful tools in the processes of analysis, decision-making, planning, curriculum improvement and development. The models will be reviewed in part as the implications of the study are considered.

Implications of the Study

The use of systemic thinking on the part of the educator is rarely encountered. Little attention has

been paid to the interactive elements operative in the social system in terms of deliberate systemic approaches. Planning and decision-making have depended on a certain sensitivity to the normative structure or response to pressure brought to bear upon the schools.

Some systemic planning has entered school systems, particularly in the form of financial decision-making processes. These forms of planning, while valuable, are potentially dangerous unless mediated by humanly oriented systemic approaches. Unless real headway is made, we are in danger of letting the wrong things be the first considerations.

Some awareness of systemic thinking in an informal sense is emergent particularly where educators have tackled some of the difficult educational problems of our time. When faced with problems such as equalization of educational opportunity or doing something about the educationally deprived, a sense of system emerges. The systemic approach to curriculum offers fresh perception of curricular problems from a new frame of reference.

A Universe of Discourse as the Basis of Professional Effort and Development

A common language was developed to serve as the

basis for joint understandings which can permit a strength of diversity and cooperative effort in any academic discipline, or derivative (applied) field of endeavor.

Different training and a variety of resultant vocabularies are prevalent in the field of education. The training of an educational psychologist leans heavily on material and language drawn from psychology. Rather than addressing themselves to the development of a universe of discourse for education, which has broad applicability across departmental lines, educators have succeeded in enhancing communication in the so-called disciplines while ignoring the development of education as a derivative field in its own right. Further, without a communication structure of shared meanings, education as an applied (derivative) field is a noncohesive patchwork of ideas borrowed piecemeal from the academic disciplines. The establishment of a universe of discourse for education depends upon the development of a conceptual frame of reference that enables educators to build the foundations and structure of their field. Once this is accomplished, other disciplines using the universe of discourse of education can make contributions to the field in the language of the educator. In

addition to this accomplishment we may even arrive at a point where the educational aspects of all disciplines will impel the "so-called" academician non-educator to seek information from the professional educator as to how the process of education might best be employed in his particular area of specialization.

An advantage in establishing a universe of discourse is lodged in the conception of what it means to be professional. In every field, other than education, professionalism connotes among other things, having a conceptual framework of the specialization and a vocabulary appropriate to its endeavors. A specialized vocabulary is for the most part an outgrowth of a field's or discipline's unique undertakings, and the desire of its practitioners to develop a degree of precision in internal communications.

The role of a professional becomes clarified in relation to lay public functions as we distinguish between education as something that requires professional training in contrast to that which everyone is qualified to speak about with authority. The establishment of a universe of discourse for the applied or derivative field of education is thus a fundamental step toward building a profession. Toward the above ends, the

universe of discourse of this study, based upon systems and model theory has been developed so that it can be widely used in curriculum and related disciplines.

Systems Theory as a Means of Reconceptualizing Curriculum

Educators have long recognized the contribution to be made from a wide variety of disciplines. Each college of education has a sampling of approximately the same set of disciplines, such as psychology, philosophy, and sociology. Each of these fields is expanding so rapidly that no one person is expected to know it completely. In addition, each discipline has its own universe of discourse, which more often than not has only passing connection with other fields.

Systems approaches provide the means by which a diversity of elements and their interrelationships extracted from a variety of disciplines can be brought together into a unified comprehensive whole. As systemic approaches are applied to educational problems, the power of curriculum as a substantive discipline in its own right can emerge.

When curriculum is viewed as a social system, the processes of planning, decision-making, diagnosis and explaining are to be sought in terms of the systems

elements and their interconnections. From this frame of reference, it is possible to view curricular problems in the context of their realistic complexity and to devise means to cope with that complexity. To consider curriculum as a course of study is to escape the social reality in which a "subject" is learned. To consider curriculum as all the experiences of a student under the direction of a school is to proceed toward an idea without a conception of what are the means of its realization.

Curriculum Change as Change in a Social System

It is odd that although we recognize the variability of rates of maturation, differences of ability and understanding in the development of skills in children, we fail to apply these significant ideas to understanding how the adult teacher or administrator functions in relation to the initiation of change and personal growth (systemic).

Hollis L. Caswell points out that a curriculum should be developed rather than installed in mass. His approach does much to recognize individual differences in relation to the development of curriculum improvement on a basis that has growth potentials for the teacher and administrative participants. Caswell states:

> . . . Modifications in practice have small beginnings with a few teachers taking the lead in the difficult process of testing new ideas. As new practices are demonstrated to be flexible, more teachers take over their use. Thus, change in the actual curriculum is represented by a jagged line of emerging practice in response to new ideas and needs. Curriculum improvement is fostered by encouraging and aiding teachers to develop innovating practices and then by facilitating the spread of those found desirable.[1]

One of the fundamental values that characterize the "American Dream" is embodied in the belief of man's prefectability. The American seems to believe that although things are not as good as they might be, they are better here than elsewhere. He further believes that whatever the situation is now, man can improve it.

As various groups in our society have become aware of their own condition, pressure is mounted to close the gap. Feeling powerless to effect change individually, the power of groups is utilized to dramatize and set the stage for change. The schools and "their curriculum" are turned to both in blame and hope.

Perhaps the most salient features to be noted about the current approaches to curriculum development

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[1]Hollis L. Caswell et al., Curriculum Improvement in Public School Systems (New York: Bureau of Publications, Teachers College, Columbia University, 1950), pp. 51-52.

are: (1) an almost frantic search for new ways; (2) a wide variety of approaches to small segments of the problems are being formulated and tested; (3) pressures upon the educational institutions are continuing with the expectations that what occurs in education will either ameliorate the social problems of our lives or the belief that education is the cause of them; (4) little effort is being made to develop comprehensive systems that integrate various findings into a common universe of discourse; (5) little impact can be said to have been made to date with the fragmented approaches in current vogue.

As we begin to apply the idea that change in one part of a system can affect another part in analyzable ways, change can be planned for as an alteration of the interactive elements in a social system.

Systems Analysis and Creativity

Much literature and research has been devoted to creativity which is usually centered around the individual. Further research is rapidly developing around the notion of the diffusion of innovation.

A new approach that is implicit in the structure of a humanly oriented systems approaches sets the

stage for the development of a conception of institutional and organizational as well as individual creativity.

The use of systems analysis and model theory by this study furnishes the means of bringing together of a diversity of disciplines into a cohesive framework. The wedding of elements and their fresh relationship are conducive to the promotion of new insights and heuristic effects. The continuing habit of taking a new look at a phenomenon is a fundamental aspect of systems analysis methodology. It implies the establishment of conditions by which a certain amount of institutional and individual creativity are a necessary part of the operation.

When man conceives of the social system not as an immutable given, but rather as something that can be improved, a positive step is taken toward the restructing of the social system. Some ideas to stimulate systemic creativity implied by the model and systems theory are: (1) change the model to alter the system, (2) systemic flexibility, (3) systemic expansion.

If men live in systems, are a part of them, and understand the system by means of models, then redefining the model should be a productive step in the change

process. In terms of the system presented here, change in personal and shared meanings as they affect and are affected by value-orientations, purposive functions, normative structure, and role expectations are the core or site from which alteration of the relationships of the persons, processes and properties can proceed. In simpler terms, a redefining to make sense in systemic terms is not something that is written on paper as in this study. It must be a change in the relationships of elements of the system. In this sense, words on paper are properties and not yet meanings.

Systemic flexibility is roughly analogous to the psychologist's idea of "openness." It suggests the willingness or ability to admit diversity into the model. New meanings (systemic expansion) as they become a part of the persons element of the system are capable of generating change in all the elements of the system.

Strategies for systemic expansion can be understood in terms of the Model for the Expansion of Shared Meanings. The working toward mutually held personal meanings suggests that at least some of the inservice education of the persons element of the system must be undertaken as a group. Enlarged personal

sets of meaning have the potential of enhanced shared meanings in the system.

Curriculum and the Individual

Much has been written in American education about the necessity to individualize instruction. One very basic idea that educators claim is that the purpose of education is to help each individual develop his own maximum potential.

Kelley,[1] Combs and Snygg[2] make a strong case for explaining the uniqueness of each individual. Educators have been exposed to the idea of importance of recognizing individual differences for a long time, yet, at the classroom level the individual continues to be treated as a member of a group. Jules Henry paints a pessimistic picture of the insidious process of conformity building that he finds in the major thrust of classroom practice.[3]

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[1]Kelley, Education for What is Real, 1947.

[2]Combs and Snygg, Individual Behavior: A New Frame of Reference for Psychology, 1949.

[3]Jules Henry, Culture Against Man (New York: Random House Publishing Inc., 1963).

John Goodlad does a remarkable job of building a case for the failure of graded plans. The spread in achievement, according to Goodlad, is more than three years in a third grade class, and four in a fourth grade class. In the seventh grade the spread in achievement ranges from the third to the eleventh grade.[1]

In the context of this study, it is evident that recognizing individual differences and implementing plans for the personalization of instruction happens in a social system. Thus, the problem of meaningful improvement is illuminated as requiring change in the system. The enhancement of personal meaning in a systemic sense depends upon the shared meanings instituted in the relationship of persons, processes and properties and their interconnections.

That each area of study has characteristic structures in essence cannot be easily denied. But the manner in which meanings typical of a subject matter are to be mediated into meaning by individual persons who perceive the world in personal styles that are unique is ignored by the structure of the disciplines

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[1]John Goodlad, School Curriculum and the Individual (Massachusetts: Blaisdell Publishing, 1966), pp. 6-7.

approach. Unless this aspect of curriculum development is seriously attended to, it can be anticipated the worthy efforts of educators to update the properties component of the curricular system will be fundamentally short-circuited.

> The discovery of self is a deeply personal matter that does not come about in blanket ways. . . . The full discovery of self as a unique individual of dignity, value and worth can only be found in an atmosphere where uniqueness is encouraged and difference is valued.[1]

Both changes and practice in current curricular systems tends to militate against the personalization of instruction by failing to conceive of interactive aspects of the totality of the basic elements of which the system is comprised. Thus, the list of what might be termed "new looks" in education, such as team teaching, flexible scheduling and self actualizing techniques could all become integral parts of a system which might contribute to the personalization of instruction. Taken separately, however, i.e., not in the systems context, they are just as likely to create a series of other

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[1] Association for Supervision and Curriculum Development, Perceiving, Behaving, Becoming: A New Focus for Education, The 1962 Yearbook (Washington, D. C.: The Association, 1962), p. 105.

problems as well as contributing answers to the originally defined problem.

Promising approaches that move toward the solution of the problem of curriculum construction and development must include such aspects as analyses of the system, diagnoses of a variety of ways of individuals' experiencing, and suggestions for implementing programs of action based on the results of these analyses and diagnoses.

While all the models generated by this study are important to the personalization of instruction, Symbolic Orientation and Symbolic Distance are particularly relevant. A diagnosis of the symbolic orientations of the learner, teacher and tasks can be made so that tasks can be defined in terms of some constructed possibilities for achieving personal and shared meanings. In this manner, reductions of symbolic distance and enhancement of personal meaning can be achieved.

The Curriculum Generalist and the Systems Approach

The introduction of a systemic approach in the field of curriculum suggests a new importance for the role of the curriculum generalist. In the context of

considering curriculum to be a course of study in need of updating, the subject-matter specialist becomes the central figure in curriculum reform.

From the frame of reference of curriculum viewed as a social system, the specialist has been attending largely to the properties element of the system. Without the orientation of a systemic approach or the leadership of a curriculum generalist, the specialist's efforts, in terms of this study, will serve to generate systemic disorder.

Concern for persons and processes is essential for systemic well-being. The emergent role of the generalist requires guidance of change in terms of anticipated consequences from a systemic frame of reference. Leadership in curriculum will require men who have awareness of the completeness and complexity of situations in which they function.

The Arts of Curriculum

The idea of qualitative thought, while not new to the field of education, has largely been ignored. The few exceptions to this statement are largely to be found among specialists whose fields of interest are

largely qualitative in character or in the works of relatively few philosophers.

School practice reveals a rather curious dichotomy of values by confining deliberate qualitative education to the conventional art fields and then allowing accessibility on the basis of talent in art or nontalent in the "so-called academics" as criteria for participation.

The mistake of considering qualitative thought as something that is confined to a special class is both unfortunate and pervasive. In Dewey's analysis:

> The world in which we immediately live . . . is pre-eminently qualitative. . . . The world forms the field of characteristic modes of thinking, characteristic in that thought is definitely regulated by qualitative considerations.[1]

Since events can be controlled in terms of consequences by using qualities to achieve pervasive qualities, curriculum events are wittingly or unwittingly achieved by the control and manipulation of qualities. To the extent that this is true, curriculum itself becomes an art. Because the achievement of qualities in a system involves the interactive elements of the system in a rather wide range of qualitatively

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[1]John Dewey, Philosophy and Civilization.

different effects, several arts of curriculum are implied and could be defined.

Each individual relationship of the interactive elements of persons, processes, and properties yields a curricular event characterized by pervasive qualities. It is these pervasive qualities which can be utilized by educators to serve as models for the control and change of the conditions which facilitate educative experiences.

Systemic Diagnosis and Change

The characteristics of curricular events are an outcome of the interactive relationships that obtain between the elements of a system. The Concern Matrix offers a method for examining the state or condition of systems in terms of the relationships that are in process in the system. Since a system's present condition and its future condition (change) are effected by the system's elements and their interconnections, it is possible to make use of the Concern Matrix to assess the present state and guide its direction of becoming.

The Model for Systemic Disorders provides the means to distinguish between conditions of well-being

and conditions of dysfunction in a system. Using this model it is possible to make further discrimination in terms of specifying the problem according to the nature of relationships of its interactive elements. While the task of correcting systemic dysfunction must await further developments, suggestions for strategies of change are implied in restructing of relationships of the systems elements and their interconnections.

Recommendations

Because of the nature of the role of curriculum personnel and their strong conviction that the involvement of people is a necessary part of curriculum change, the systemic approach has a strong kinship with emergent practice. In this study an explicit formulation of the basis for a systemic approach to curriculum has been developed, but much remains to be done.

The process of reconceptualizing curriculum in terms of a systems approach opens up a wide variety of possibilities for further study and development. Conceptual frameworks stand as a beginning from which efforts toward theory building and applications in practice can proceed.

The recommendations resulting from this study

are examples of ideas and ways in which it may be valuable to further explore a system theory approach to curriculum. The order of presentation is not intended to indicate any particular priority or level of importance.

Recommendation #1. General systems theory and model theory are rich resources for the development of fresh perceptions in the field of curriculum. Further investigation of these resources should be made to assess their possible contribution to a refined and enlarged set of conceptual frameworks for curriculum.

Recommendation #2. Since a theory or a conceptual framework must be translated to apply to specific problems, it is recommended that specific problems be diagnosed and remediated from a systemic approach. This should yield a background of case materials and empirical testing of the significance of this approach. Application of conceptual frameworks to practice can serve some important functions: (1) the enrichment of practice by the addition of new perceptions; (2) the refinement of modifications of the model being used; and (3) serve as a source for theory building.

Recommendation #3. The processes of decision-making involve the organization of systemic energies. They include, among other things, the social processes

of power, authority and legitimation. The value of considering curriculum as a social system is related to the achievement of outputs (consequences) by means of organizing the interactive elements of persons, processes and properties. In this context, the means become the energy inputs of the system.

Information from the various fields of social science, administration and supervision can serve as resources for the further study of social processes as they function in the curricular system. In order to enhance our understanding of the systemic character of curriculum, it is important to learn more about the ways in which curriculum events occur. Therefore, it is recommended that studies that focus on the social processes affecting decision-making be examined for their relevance for curriculum viewed as a social system.

Recommendation #4. The qualitative ordering of curricular events suggests the possibility of establishing a foundation for several "curricular arts." It is recommended that further investigation of qualitative symbolic mediation take place to identify, develop and construct the theoretical foundations of the "curricular arts" in specific formulations.

Since art in this context is a process that is conducted by persons to generate qualitative outcomes

(consequences) in a social system, a basis for the identification of specific arts may be found in the area of human interaction.

Recommendation #5. The Concern Matrix and the Model of Systemic Disorders are two models that have analytic potential and heuristic capacity for remediation in examining curriculum as a social system. Both models were generated to demonstrate the application of a systemic approach to problems of curriculum change, furnish a conceptual viewpoint and provide a basis for decision-making in terms of potential consequences. The Concern Matrix represents a method of analysis of the interactive elements of the curricular system. The Model of Systemic Disorders identifies eight conditions or states of a curriculum system. In each case, empirical studies are needed in order to test the applicability of the model to problems in the curricular system.

Where actual problem situations are not available for experimentation, simulated models of problem situations can be formulated for experimentation. Models can be assessed for potential consequences with and without remedial treatment. With testing and experimentation, modifications and additions to the models can be made to improve their worth and function for the educator.

Concluding Statement

Progress in education comes in many guises. With the advent of federal programs, the single biggest impact toward change was the increased resources brought to bear on developing innovative ideas. Having a non-creative tradition upon which to draw, educators did remarkably well in problem solving and testing out ideas for which neither money nor time was previously available. As the pressures and the politics of the supra-system shift and the problems we set out to solve still remain, educators will seek new answers.

Much of the orientation of the change-minded educators has been applied in the direction of solving problems or adopting answers. In order to make an impact on change in the curriculum system, it is necessary to include problem finding as a first step toward a more creative orientation. It is hoped that a re-conceptualized orientation toward curriculum will be helpful to others as they re-examine the conditions for facilitating educative experiences.

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