Is Systems Analysis for Supervisors?

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SUPERVISION in education is an applied discipline whose professional ranks are chiefly made up of field practitioners. As a consequence, the theory and knowledge that have fueled practice have been chiefly developed through analogy from the research in allied behavioral sciences. Thus we see in the past three decades major contributions to supervisory practice developed from learning theory, role theory, group dynamics; and, more recently, from sensitivity training, teacher behavior research, classroom interaction analysis,[1] and organizational theory.[2]

Among the latest newly emerging analogous developments holding potential for supervisory practice is *systems analysis*. The definition of systems analysis as used in this article encompasses the term in its broadest sense ". . . any orderly analytic study designed to help a decision maker identify a preferred course of action from among possible alternatives. . . ."[3] There are other more restricted, and purportedly more precise, definitions of systems analysis, which specify use of mathematical models and cost effectiveness procedures in weighing and selecting alternatives. However, these approaches, popularized by former Secretary of Defense Robert S. McNamara, which emphasize techniques of cost accounting and mathematics, can ignore or distort other variables which are not specifically quantifiable.

Other systems experts have documented the severe limitations of the mathematical model systems approach when applied to situations that have emergent (variables are unclear and changing), and not established, qualities.[4] Supervisors are much more likely to be involved in situations composed of vari-

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[1] One comprehensive statement with many pertinent suggestions for applications of the research on teacher behavior to supervision is: Louise M. Berman and Mary Lou Usery. *Personalized Supervision: Sources and Insights.* Washington, D.C.: Association for Supervision and Curriculum Development, 1966. 64 pp.

[2] For an example of the use of developments in organizational theory and research as analogies for supervisory practice see: William H. Lucio. "The Supervisory Functions: Overview, Analysis, Propositions." In: *Supervision: Perspectives and Propositions.* William H. Lucio, editor. Washington, D.C.: Association for Supervision and Curriculum Development, 1967. pp. 1-11.

[3] E. S. Quade. "Systems Analysis Techniques for Planning-Programming-Budgeting." Santa Monica, California: The RAND Corporation, March 1966. p. 1.

[4] A clear definition of established and emergent situations and a trenchant criticism of the error in applying approaches designed for established-to-emergent situations is contained in: Robert Boguslaw. *The New Utopians.* Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1965. pp. 7-9. For a recent criticism of the closed-ended approach of systems analysis which is particularly applicable to education, see: Victor A. Thompson. "How Scientific Management Thwarts Innovation." *Transaction,* June 1968. pp. 51-55.

ables which are unstable and in many cases unknown; consequently, assignment of specific quantities to these variables can be a delusion.

As curriculum and instruction advance in complexity, supervisors have felt the need for more sophisticated skills to cope with demands made on the professional role. As in the past, when supervision has selected from allied behavioral science research aspects which assist in meeting specific problems, selected techniques of systems analysis offer promise of upgrading supervisors' technical skills to deal with the problems which confront the supervisor in new developments in curriculum and instruction.

Systems analysis *in toto* is far too comprehensive a field for treatment in a short article. It is the author's purpose here, however, to propose concepts and techniques of this approach which appear to have special significance for the supervisor.

A Total Systems Emphasis

At the heart of systems analysis theory is a conceptualization, which can serve as an important foundation for delineating the role of the general supervisor; the total system is the unit to be used in analysis and planning. A total system in the case of the general supervisor could be the total curriculum design and its influence upon the student.

It must be recognized that the total system approach runs counter to the recent dominant trend, supervision by separate subject areas, and to the movement from general supervision over several subject areas to specialized supervision in one subject area. Moreover, the movement for specialized supervision from the standpoint of a total system approach falls heir to the negative criticism directed at the excessive fragmentation of curriculum. Among the net effects of fragmentation of curriculum on students are these: further competition for their learning time, a tendency to teach techniques and processes in isolation from social applications, and a reductionism of instructional goals to simple accumulation of more subject matter. Furthermore, if we really wish to measure the long-range impact of educational institutions and their curriculum on students, there is some hint that the total influence of the system may be a better predictor than the more finite measures of achievement in each separate subject.[5]

The total impact of the curriculum and the interrelationships of the various components of the curriculum necessitates the viewing of a curriculum as a total system, and has received minimal attention. Certainly, there is a badly needed role to be fulfilled if one merely begins to catalog the problems that are prevalent and attributable to the inadequate consideration given to designing the curriculum as a total system. A sample cataloging of some of the problems in curriculum design that result from approaching curriculum and attendant supervision on a piecemeal basis rather than as a total system follows:

1. Curriculum dissonance: contradiction, incompatibilities in teaching methods in subject areas, experiences which produce destructive conflict at a level to cause students to reject the curriculum.

2. Coordination: concern for commonalities as well as duplications with emphasis on unity in the curricular experiences for the student as he pursues the various subject areas.

3. Balance: concern for relationships of general education to special education, vicarious and firsthand experiences, product and process learning, pupil-directed and teacher-directed learning activities.

4. Excessive complexity of areas of experience: overexpansion of curricular offerings, excessive commitment of students' time in special areas, exploitation of students in areas of experience for purposes other than personal growth.

5. Continuity: preserving and expanding threads of experiences from grade level to grade level and one school to another, observing principles of learning in concept presentation enabling structural development of fields of inquiry.

[5] For an example of the types of questions under investigation on overall impact of educational institutions and their curriculum, see: Martin Trow. "The Meaning of Impact." Proceedings of the 1966 Invitational Conference on Testing Problems, Educational Testing Service, 1966. pp. 25-33.

6. Application of analogous development in separate subject fields: for example, "learning by discovery" techniques developed in science applied to health or mathematics, and the development of organizing principles for masses of data.

7. Evaluation of total curriculum design: gathering data on the total influence of the school experience, investigation of dysfunctioning in general or special education areas, desirability of adding or terminating curricular offerings depending on contribution to the total design.

8. Assessment of internal and external efforts to effect change in parts of the curriculum and the impact on the curriculum design.[6]

An appropriate analogy to the necessity of supervisors' viewing curriculum design as a total system is the recent turn toward a comprehensive approach to urban planning. There it was found that urban reconstruction must be viewed as a total system having economic, political, business, educational, and organizational variables as contrasted with an earlier simplistic approach of razing deteriorated buildings in order to provide warm, efficient, rat-free housing for the poor.

The failure of supervisors and administrators in education to treat curriculum design as a total system and the continued emphasis on the piecemeal approach are equally as disastrous. As Alfred North Whitehead insightfully observed so many years ago, educational objectives, especially in a broad sense, cannot be met by fragmenting life experience into discrete separate subjects. The resultant of a less than total system view is seen in some of the current "new" separate subject curricula, in which significant social problems are ignored for abstract technical and "scholarly" objectives.

While there are hopeful signs that the profession is becoming more interested in a total operating unit approach, which conceives the designing of the curriculum as a total system, there is a major need for serious scholarly study by supervisors and curriculum workers of the more specific techniques that systems analysis has developed for approaching complex problems.

Models

When a systems approach to a problem is used, large quantities of data are generated, and a multitude of variables are encountered. One procedure which had been employed by systems analysis to organize and reduce variables and data to manageable proportions has been that of *models*. Models, according to one philosopher of science, are the *sine qua non* of science for they are the primary mechanism for systematically abstracting, organizing, and relating complex variables.[7]

Kenneth Boulding recently characterized the chief purpose of models as the "doing violence to complexity." He cited as a prime exemplar the model used by economists, "Gross National Product." So acceptable has this model become that the initials GNP have become part of the conventional wisdom. When one reflects on the violence that such a model does to complexity (the figure GNP includes *all* goods and services nationally produced), supervisors should not be reticent to try model building in curriculum and instruction, since the complexity in these fields cannot be greater. Further encouragement to undertake model building in curriculum and instruction is given when one reflects on the boon that the GNP model has been to economic analysis and forecasting.

Supervision has been lacking in models with a clear-cut design of activities directed to instructional improvement. The cost effectiveness of instructional improvement efforts in particular has been neglected. Models which are directed to identifying the critical variables, positing the relationships, manipulating these relationships, and evaluating outcomes do assist in superimposing control over otherwise uncontrolled and previously indeterminate outcomes.

[6] Maurice J. Eash. "Guidelines for Preparatory Programs for Supervisors and Curriculum Workers." In: *Toward Professional Maturity of Supervisors and Curriculum Workers*. Roy Patrick Wahle, editor. Washington, D.C.: Association for Supervision and Curriculum Development, 1967. pp. 21-22.

[7] Abraham Kaplan. *The Conduct of Inquiry*. San Francisco, California: Chandler Publishing Company, 1964. p. 258.

Let me be more specific. A recent in-service education project in which the author has acted as a consultant is developing a model directed to retaining and improving the effectiveness of beginning teachers. The postulates on which the model is based are drawn from research on organizational behavior and sensitivity training. Using research from these areas, definite objectives for the in-service education of new teachers were established, a planned series of transactions was organized, internal and external evaluation of the program was planned. A cost effectiveness procedure is being built into the model.

There is evidence that retention of a teacher saves the school system approximately $800 in recruitment of a replacement. Proceeding on the assumption that experienced teachers are more effective than inexperienced teachers, a procedure of assigning weights to increased teacher effectiveness as the result of experience is being tested. In this model, a cost effectiveness criterion on retention and increased teacher effectiveness is being devised. If the model is viable, then it will be used to guide other in-service programs and extended to in-service programs for more experienced teachers. This is only one example of the importance of model building to guide a common supervisory activity; others might be described in building instructional units and in similar supervisory problems.

For supervisors' use, the most significant contribution of systems analysis may be iteration. Model building becomes an essential process of iteration in moving from the talk to the action stage. Iteration contains ten steps: selecting objectives, designing alternatives, collecting data, building models, weighing cost against effectiveness, testing for sensitivity, questioning assumptions, reexamining objectives, opening new alternatives, formulating the problem.[8] Thus, model building is placed in the cycling of a problem. Although the tool of iteration does not guarantee a solution, it does offer far more protection against mis-identification of a problem or being seduced by one's own built-in biases.

[8] E. S. Quade, *op. cit.*, pp. 8-11.

Specific Approaches to Models

Systems analysis has pioneered specific techniques which are used in model building where one faces many uncertain parameters and a number of alternatives. To experienced supervisors who have been recipients of "mustang" reactions in human organizations, when what were thought to be mild uncontroversial proposals were made, there is scarcely need to dwell on a definition of uncertain parameters.

Most of the problems in supervision do not lend themselves at this time to precise mathematical formulation. Therefore, there is a basic need to rely on models and techniques which do permit more rigor than the usual way of playing it by hunches, but do not mislead with a pretense of precision that is unobtainable.

Operational gaming is a laboratory simulation approach in which a group of experts are gathered together and asked to simulate the attitudes and consequent decisions of their real-life counterparts. Rules governing the options, constraints, and actions are provided by experts with a knowledge of the real-life counterpart. From the interaction, hopefully the participants will gain insight into the predictions of actions and reactions which result within the gaming model and indirectly the real world which it represents. In-service programs and curriculum design approaches might all be tested out by supervisors through operational gaming techniques.

Scenario writing is a model building technique that has been used by military systems analysts to show how, starting with the present state of affairs, a future state of affairs might evolve through following a reasonable course of action.[9] When several individuals produce scenarios, many alternatives are developed and factors influencing

[9] As an illustration of a use of scenarios in a problem with many indeterminancies, and in this respect, not totally unlike those supervisors meet, see: Gilbert Burch. "How Big a Peace Dividend?" *Fortune* 77(6): 86-89 ff; June 1, 1968.

future events are laid bare. Thus this series of primitive models shows how the future may be determined by present factors and suggests options and intervention strategies.

In a very rough sense, scenarios of curriculum are available in the evaluation data which are gathered for accreditation purposes in many high schools. A recent study [10] of the longitudinal influence of the accreditation process on curriculum change found it to be very limited, principally due to lack of follow-up, accreditation in this study coming only every 10 years. A further handicap was the presentation of recommendations by the evaluators, which were subsequently rejected by the high school staffs as too expensive, too time consuming, or otherwise too impractical to implement. If both evaluators and the evaluated understood the basic elements of scenario writing, accreditation visits could produce models to guide systematically further curriculum study.

A third method in model building is one that appeals to long-suffering participants in committees, and is directed toward dispensing with conventional committee meetings. The *Delphi method* [11] exchanges committee confrontation for an interchange of expert opinion through a carefully designed sequence of questionnaires by a third party. After the initial data from the first questionnaire are collected and compiled by the third party, a second document containing information on positions is exchanged and interrogation is begun on assumptions and data supporting positions. The process can be continued until consensus is achieved or conflicting positions are carefully documented.

The obvious advantage of obtaining experts' opinions without the necessity of convening them is perhaps not as significant as the circumventing of many of the psychological shortcomings which stymie committee meetings. The Delphi method merits considerable field investigation in supervision in which committee work has been the heart of practice. It could also test the hypothesis of whether group interaction is necessary to obtain follow-through on the part of participants, certainly one of the hallowed rubrics of supervision.

In sum, what systems analysis has to contribute to supervision are precisely those tools and techniques which the supervisor has lacked. These tools and techniques are a conceptual framework to view curriculum improvement; a procedure to select, refine, and delineate objectives; systematic comparison of alternatives; and use of a logical sequence of procedures in cycling problems that can be replicated and validated by others.

For several reasons, supervisors have been concerned about their lack of role definition and even the viability of their role in the organizational scheme of education. The lack of rigorous training and technical skills has handicapped supervisors' efforts to tackle significant problems in curriculum design and instruction. Supervisors knowledgeable in the technical skills of systems analysis, a few of which have been outlined here, will be ready to furnish leadership in the improvement of instruction. Supervisors so equipped will not be required to struggle for role definition; a functional role awaits them in every school system. □

[10] Vynce A. Hines and William M. Alexander. "High School Self-Evaluation and Curriculum Change." Paper presented at the American Educational Research Association Annual Meeting, 1968.

[11] Norman Dalkey and Olaf Helmer. "An Experimental Application of the Delphi Method to the Use of Experts." *Management Sciences* 9(3): 458-67; April 1963.