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ABSTRACT

One form of Regional Educational Agency (REA) is the Educational Cooperative, which was under field development for several years by the Appalachia Educational Laboratory, Inc. (AEL) and the United States Office of Education. The program included an evaluation effort, and the general design, instrumentation, and comprehensive bibliography for that effort are presented herein. The general design is from the perspective of the cooperative, or REA, as organization qua system for problem-solving and decision-making, and some of the ideas may be of use in evaluations of REAs. The instrumentation and bibliography cover areas such as needs assessment, planning, evaluation, and organizational management, and other REAs may find some use for the information on instrumentation and bibliography. A formal statement of the development aspects of the program may be found in the monograph, The Educational Cooperative: A Design for a Regional Educational Agency by Hayes Wilcox, et al. through AEL, Inc. (Author)

Evaluation of Regional Educational
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CHAPTER 1

THE EDUCATIONAL COOPERATIVE

Section 1. Character of the Educational Cooperative

The Educational Cooperative Development Program was embedded in a neomobilistic decision setting and operated via a decision model of planned change. A neomobilistic decision setting is an attempt to get large change in a low information field. A decision model of planned change is a developmental sequence including needs assessment, feasibility analysis, design and engineering, field testing, and diffusion. The Educational Cooperative Development Program attempted to generate a large change in organizational management structures of school systems from the vantage of a low information field. A product to attain this goal is the Educational Cooperative.

Other decision settings and decision models are involved. The individual Educational Cooperatives probably are in incremental decision settings and operate via a decision model of disjointed incrementalism, small change in a low information field. The local school systems most likely are representative of homeomorphic decision settings and operate via a synoptic decision model, with small change in a high information field. The Educational Cooperative Development Program involved action across these several levels of aggregation in multiple decision settings and operated through several decision models. Considerable complexity inhered in the program relative to decision isomorphism in meaningful product development.

The principal axis of the organizational identity fostered in the Educational Cooperative was the character of a social system with a mission as an institutional educational change-agent. The Educational Cooperative was conceived as a purposive macro-system with an adaptive dynamism for the

facilitation of school system renewal. The purposive macro-system is a regional collaboration on the enhancement of systems decidability. Collaboration on systems decidability evokes a functional compatibility of value-orientations, need-structures, resource mix, and adaptive rationality.

Adaptive systems rationality operates under positive sanctions of accountability and effectiveness. The facilitation of school system renewal involves the Educational Cooperative as a model of administrative practices in its systems rationality such that constituents reallocate resources reflecting renewal.

The character of the Educational Cooperative fostered by the Appalachia Educational Laboratory is evident in the objectives and specifications for Educational Cooperatives.

1. Objectives

- a. To make available for the participating districts cost-effective educational programs and services on a regional basis.
- b. To serve as a model of administrative practices which will enable participating districts:
 - (1) to analyze educational problems and devise solutions in an orderly, rational manner.
 - (2) to reallocate resources in order to achieve desirable educational outcomes.
- c. To bring resources of other organizations (particularly state departments of education and institutions of higher education) to bear upon the problems of participating districts.

2. Specifications

- a. Membership
 - (1) Membership in an Educational Cooperative is composed of contiguous school districts whose governing boards agree to join in cooperative effort to attack common educational problems.
 - (2) Two types of membership are provided:

- (a) Unitary members are those school districts located within a single planning and development district as defined by an appropriate state agency.
 - (b) Contractual members are those school districts located outside a planning and development district from which the unitary members are located but which are invited to join the Cooperative.
- (3) Conditions of membership in the Cooperative are defined by the board of directors of the Cooperative.
 - (4) The decision regarding the number of member districts to admit to a Cooperative must take into consideration the size of the geographic area (a driving time of no more than one hour from the central location is recommended) and the number of pupils enrolled (no fewer than 20,000 or more than 60,000 is recommended).

b. Governance

- (1) The Cooperative is governed by a policy board composed of the superintendents of the participating school districts.

Representation on the board with voting rights may be extended to any agency or organization which has a legitimate interest in the activities of the Cooperative.

- (2) The policy board employs a director of the Cooperative who serves as the board's executive director.
- (3) The director of the Cooperative has responsibility for the following activities:
 - (a) To collect and organize information about education outputs of the participating school districts to enable the Cooperative board to establish educational priorities.
 - (b) To recommend for board evaluation and action appropriate programs to achieve goals specified by the board.
 - (c) To conduct comprehensive evaluation of each program operated by the Cooperative.
 - (d) To assign and supervise all personnel involved in programs operated by the Cooperative and to coordinate their activities.
 - (e) To prepare policies and regulations for the operation of the Cooperative subject to approval of the board.
 - (f) To prepare and administer a budget for the Cooperative.

- (g) To recommend for board action all appropriate matters related to personnel administration.
- (h) To establish and maintain mutually beneficial relationships with appropriate agencies and organizations.
- (i) To monitor the environment for sources of financial support for the Cooperative.
- (j) To administer all facilities and equipment of the Cooperative.

c. Financing

- (1) Financial support for Cooperative programs may be solicited from any legal source of funds with approval of the board of directors.
- (2) In the event that the Cooperative is not legally empowered to act as its own fiscal agent, a member system performs this function.
- (3) Local support of the Cooperative on a per pupil basis is to be encouraged.

d. Services

- (1) Programs selected for operation by the Cooperative should meet the following criteria:
 - (a) The program shall be designed to meet previously identified educational needs within the planning and development district.
 - (b) The program belongs at a regional level of operation, by reason of economies of scale or is operated as a demonstration.
 - (c) The program has reasonably good chances of continued funding.
 - (d) The program is cost effective in comparison with alternatives.
- (2) Member school systems may choose to participate in any or all programs offered by the Cooperative.
- (3) The process of selecting and operating programs in the Cooperative should adhere to the following sequence of events:
 - (a) Measure and assess education needs of the districts and Cooperative area.

- (b) Identify the rank priority of deficiencies.
- (c) Set minimum acceptable standards for solutions.
- (d) Specify desired outcomes.
- (e) Search for alternative methods to achieve desired outcomes.
- (f) Choose most promising acceptable method.
- (g) Organize and implement program.
- (h) Evaluate results of new program.

Section II. Process

1. Problem-Solving

The Educational Cooperative may be conceptualized as an organizational algorithm for problem-solving, or decision-making, beyond the homeomorphic constraints of the local district in the incrementalistic multi-district domain. The organizational algorithm includes needs assessment, planning, programming, and evaluation. Problems which are basically undecidable on the local level may be solvable on a regional level through this algorithmic process.

2. Needs Assessment

A needs assessment addresses the adaptation of the school system in its external environment. Needs are the coenetic variables through which the educational institution makes a viable interchange with the environment. Needs are the basic alphabetic characters of an algedonic metalanguage of external politics providing completion from without and granting acceptance which amounts to institutionalization of the system. The logical structure of these needs of an educational institution may be incomplete. Attention to incompleteness involves continual monitoring and upgrading of the need-structure. Some external validity may be achieved.

3. Planning

Once a need structure has a functional closure, the consistency, cohesiveness, interdependency, coherence, and internal validity of future action must be assured in order to achieve satisfaction relative to identified needs. Pervasive objectivity and reliability are essentials for planned action. Planning formulates an integration of action for goal-attainment on need-satisfaction. This integration is achieved through setting priorities and standards and generating alternative courses of action.

4. Programming

A need structure and plan are followed by a program elaborating a chosen alternative course of action. Elaboration of the program through specifications compatible with standards is a design activity. Program maintenance through resource allocation and internal politics is essential to implementation. The problem of programming is controllability; that is, any system state can be transformed to any final state in a finite time interval by some control.

5. Evaluation

Goal-attainment is the central focus of evaluation. The unhealthy goal defocus and ambiguity of school systems are well known. Perhaps the ultrastability of educational institutions is a reflection on the credibility of the algedonic metalanguage of its needs-structure as well as the relevance of program. Criteria of success enunciated in standards and specifications must be subjected to operationality to synthesize a judgment on effectiveness which is defensible. The basic problem of evaluation is observability; that is, an antecedent state can be determined from output measurements in a finite time interval.

Section III. Structure

A pattern supportive of the process of the Educational Cooperative may be referred to as the structure. The structure includes policy making, a management information system, personnel management, and business management.

Section IV. Product Manuals

Procedures for each of the major aspects of the process and structure were developed through field testing for diffusion to Cooperative consumers. The diffusible products of the Educational Cooperative Development Program is the monograph: The Educational Cooperative. By-products included two field test site Educational Cooperatives, and a methodology for institutional assessment and evaluation included in this document.

The monograph is a guide on organizational management for Educational Cooperatives as institutional change-agents, facilitators of system renewal by macro-dynamics. The monograph is not primarily an instructional package, training material, nor self-teaching materials for administrators. The aim is to facilitate organizational learning, not individual learning. Individual learning is an intervening variable between learning states of the Cooperative, and between the Cooperative and a constituent school system. The emphasis is nomothetic-transactional, not idiographic-transactional. The level is institutional-organizational, not interpersonal-personal. Of course, the administrator is the mediator of effects.

CHAPTER 2

EVALUATION STRATEGY

Section I. General Strategy

The delineation, procurement, and provision of information relevant to decisions is termed evaluation. The cooperative qua organization is a major decision area. The purpose of this chapter is to suggest a meta-structure for the delineation, procurement, and provision of information about the cooperative qua organization.

Various schemata have been advocated for evaluation, for example, Cook (1970), Provus (1971), Rudwick (1966), and Stufflebeam et al. (1971). The general evaluation model for the cooperative has a theoretical basis in organizational uncertainty (Stepp, 1974).

Any evaluation needs to satisfy certain criteria for adequacy (Stufflebeam et al., 1971). These criteria cover scientific, practical, and prudential conditions. Scientific criteria include internal validity, external validity, reliability, and objectivity. Practical criteria include relevance, importance, scope, credibility, timeliness, and pervasiveness. The prudential criterion is efficiency.

Implicit weights given to the criteria for evaluation reflect the judgmental constraints of the host institution. A mix of uncertainties bearing upon the situation of the given cooperative forge a test of wisdom and art for the leaders.

Under these institutional constraints the evaluator must have a mature sense of integrity and exercise independent judgment; the evaluator must be able to interact with the decision-maker on substantive matters, but be able to detect and reject any nuances of cooptation. Likewise, the decision-maker should extend to the evaluator the trust, faith, confidence, and

essential autonomy to evaluate adequately; the decision-maker must be able to interact with the evaluator on substantive matters, but reject any temptation to either dupe or coopt the evaluator. The principal evaluator would be able to render better service from a position as an external consultant.

Evaluation may be resolvable into two principal emphases, namely, a formative emphasis and a summative emphasis. Formative evaluation differs from summative evaluation in being concerned more with transitory (including transient) conditions in contrast to terminal status, and in an orientation toward parts rather than wholes. The Educational Cooperative may be regarded as an ensemble of decision subsystems: (1) needs assessment, (2) planning, (3) programming, (4) evaluation, (5) policy-making, (6) information systems, (7) personnel management, and (8) business management. In the Aristotelian vein these decision subsystems are the substance of which the specifications are the form. Formative evaluation resolves decision subsystems from each other and determines the potency of each manual in doing its thing in the ensemble-of-manuals. Summative evaluation involves a total view of the ensemble-of-manuals in a dynamic interplay to attain mission. Together the formative-summative evaluation provides an integrated, fused, unified perspective essential for an ensemble-of-manuals.

The control of a process to realize goal-attainment is crucial to the enterprise of the development of Educational Cooperatives, and this concept is basic to cybernetics. The mapping of a policy on the manuals into a realization of an ensemble designed a priori is a cybernetic system. A cybernetic development system may have a model-referent for self-organization which maps a phenogenetic policy and genotypic process into a phenotypic realization; an ontogenetic discriminator, or comparator, may indicate any

deviations from the model-referent to the phenogenetic policy-maker for iterative approximation. In terms of the Educational Cooperative, the genotypes are the decision subsystems, and the phenotypes are the organizational variables accessible to observation. Formative evaluation includes phenogenetic modeling aimed at the generation of policy on the genotypic decision subsystems to converge the phenotypic realization toward the ontogenetic model-referent of a designed Educational Cooperative. Formative evaluation attends to the micro content and summative evaluation attends to the macro content. This is similar to a figure-field Gestalt or a quantum-field framework, that is, a part-whole perspective (Figure 1).

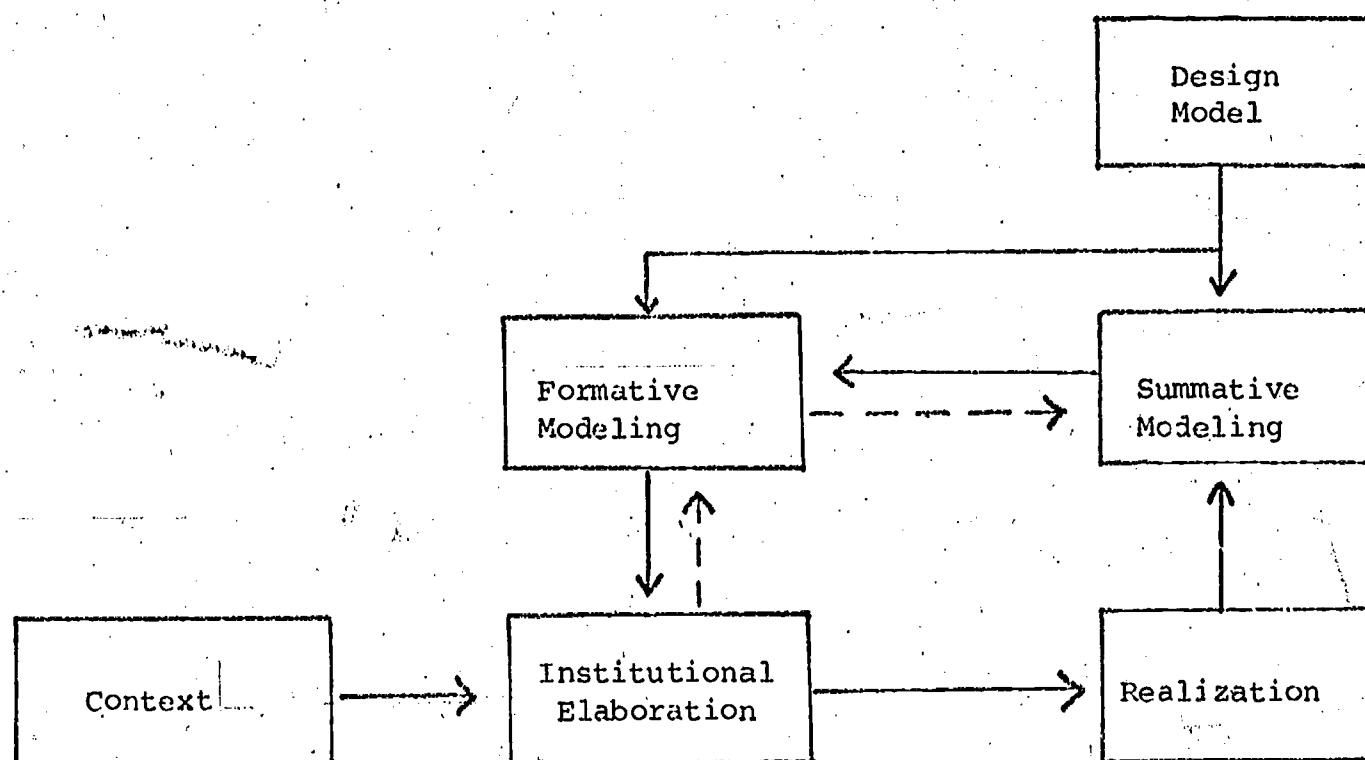


Figure 1

Institutional Evaluation Model

Macro features attended to in summative modeling converge on the designed model-referent for the cybernetic development system. The authentication of realization as a manifestation of design is a central function of summative modeling. The elaboration of realization requires positive feedback to amplify deviation from the preceding state of the system (Buckley, 1967). However, the question of congruence of realization with design is a question of negative feedback, technical deficiency.

Section II. Summative Evaluation

Summative evaluation is concerned with the integrated Educational Cooperative, the overall effect on gross gauges de-emphasizing the decision subsystems as entities. General summative evaluation includes the authentication of elaborated realization as the manifestation of design, without bringing a decision subsystem into sharp focus. This is comparable to sampling the ammonia and giving feedback signals indicating the yield and the rate of yield in the Haber process. Authentication of the embodiment of design in elaborated realization is a basic task of summative evaluation. Confirmation of elaborated realization as an embodiment of design would be a reserved authentication of the adaptive convergence policy. Falsification of elaborated realization as an embodiment of design would demonstrate a need for the modification of the formative convergence policy.

An educational institution, as an assemblage of genotypic actions, is representable by states, a minimum set of numbers expressing the history of the institution - past, present, and future. Of course, some states may be inaccessible and not numerically denotable in the present state of the art of evaluation. However, a state-space of all numerically denotable

coordinates may be conceptualized for the multidimensional phenotypes of realization in institutional development.

1. State-Space Representation

A state-space representation of the Educational Cooperative takes the form of Figure 2. The application of a policy, P , to the state of the institution, S , is mapped into the next state of the institution ($\delta: P \times S \rightarrow S$). Also, the product of the policy-state interaction is mapped into the output yield, Y , that is, $\omega: P \times S \rightarrow Y$. If $s \in S$, $p \in P$, and $y \in Y$, then the mapping functions may be given as vector matrix equations.

$$\delta: \dot{\underline{s}} = A \underline{s} + Bp$$

$$\omega: \underline{y} = C \underline{s} + Dp$$

The change to the next state of the institution may be given by:

$$\underline{s}(t) = \phi(t, t_0) \underline{s}(t_0)$$

wherein $\phi(t, t_0)$ is the state transition matrix.

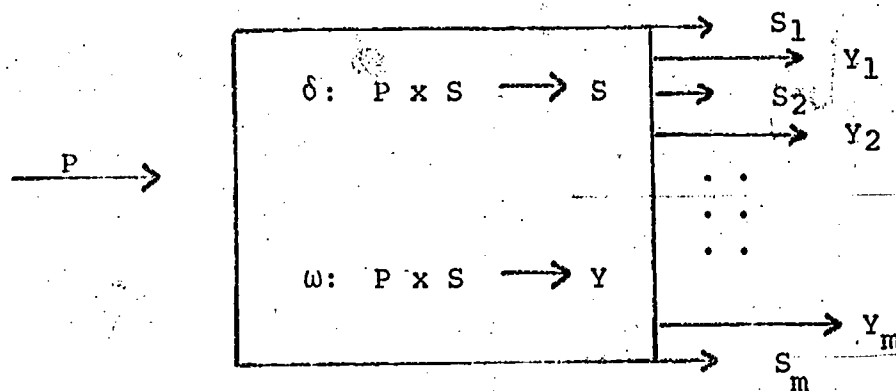


Figure 2

Educational Development:
State-Space Representation

2. Performance Index

Summative evaluation is fundamentally concerned with the performance index of the institution. The adaptive convergence policy in conjunction with existing institutional states maps into a realization with some loss relative to design. The performance index, $J_0(\underline{S}_0, t)$, is a weighted composite of terminal error, P , instantaneous error, Q , and cost of control, R (Ogata, 1967):

$$J(\underline{S}_0, t) = \underline{s}^*(T)P\underline{s}(t) + \int_0^T \underline{s}^*(t)Q\underline{s}(t)dt + \int_0^T \underline{p}^*(t)R(t)\underline{p}(t)df$$

The minimization of the performance index provides a capability for making the most expeditious transit along the system trajectory: that is, the institution can map a realization of phenotypes with the least ontogenetic departural stress from the model-referent of design. Thus, a minimal randomness and a maximum negentropy is attainable with reduced error and diminished cost.

The mapping of realization must be a computable function, that is, a finite number of operational actions based on policy must ensue in the phenotypic targets. For each subset of the realization space for which a criterion for satisfaction is to be prescribed, a characteristic computable function must be evaluated which is denotative of acceptance or rejection. A set for which a characteristic computable function exists is a decidable set; otherwise the set is undecidable. Summative variety in the evaluation of the Educational Cooperative is to be decidable sets with characteristic computable functions for the mapping of the conjunction of adaptive convergence policy and institutional states into next-states and output yield.

The variety space must be capable of regarding the realizations of several Educational Cooperatives as homomorphic cases of each other and with the model-referent of design. That is, the model-basis must be

representative of all Educational Cooperatives, whatsoever, with respect to institutional state variables, control policy variates, and output variety.

Section III. Formative Evaluation

1. Adaptive Convergence Policy

Formative evaluation may well be said to be concerned with the continuing modification of policy on the microcosm of manuals and their implementation to yield desired results. The formative focus is upon the manual implementation first, and upon the Cooperative ensemble only as a target status. This is comparable to planning the changing of the temperature and pressure to shift the equilibrium in a chemical reaction, such as the Haber process in generating ammonia, from hydrogen and nitrogen.

The elaboration of realization is a morphogenetic transition, the actualization of design, and more than a terminal congruence. The actualization of design through the elaboration of realization from micro units, or manuals, is formative convergence. The elaboration of realization is a self-organizing embodiment of the decision subsystem and implied interrelationships. Self-organizing embodiment is attained through the encoding of an adaptive policy on the convergence of realization upon the designed model-referent. An adaptive convergence policy is the focal, proximate target of formative evaluation.

Policy change is induced by the corruption of phenotypic realization, degradation in performance, and entropic degeneration. The finite game of formative convergence, in terms of the states and outputs of the institution, involves hunting in a parallel search through the repertoire of the multi-variate weights of possible moves to stabilize the institutional mapping.

Stabilization precludes the dissipation of scarce resources and a movement of the operational trajectory beyond the boundaries of a feasible universe. Lipunov's second method for stability analysis is a germinal prospect for application to this problem (Lipunov, 1966; Ogata, 1967; Schultz and Melsā, 1967). Once stabilization is attained, the satisfaction of system goals may be pursued (Messarovic, 1970). In some instances it may be possible to optimise yield, for example, in reallocation of resources, by applying the methodology of optimal adaptive control systems (Bellman, 1961; Aoki, 1967; Koenig, 1967; Zemach, 1969).

2. Formative Search

A test of translational loss, a discrepancy between level of aspiration and expected value of reward, is made relative to minimum standards and program specifications. March and Simon's (1959) general model of adaptive motivated behavior leads to several propositions on Cooperative system-level behavior.

1. The less satisfaction, S , (on standards and goals or specifications): the greater the search, L , for solution.
2. The greater the search, L , for solution; the higher the expected value of reward, E (Y).
3. The higher the expected value of reward; the greater the satisfaction.
4. The higher the level of aspiration, Y_g ; the less the satisfaction.
5. The higher the expected value of reward; the higher the level of aspiration.
6. A constant level of aspiration implies a stable equilibrium with level of aspiration exceeding expected value of reward.
7. A constant expected value of reward implies a search directly proportional to the expected value of reward.

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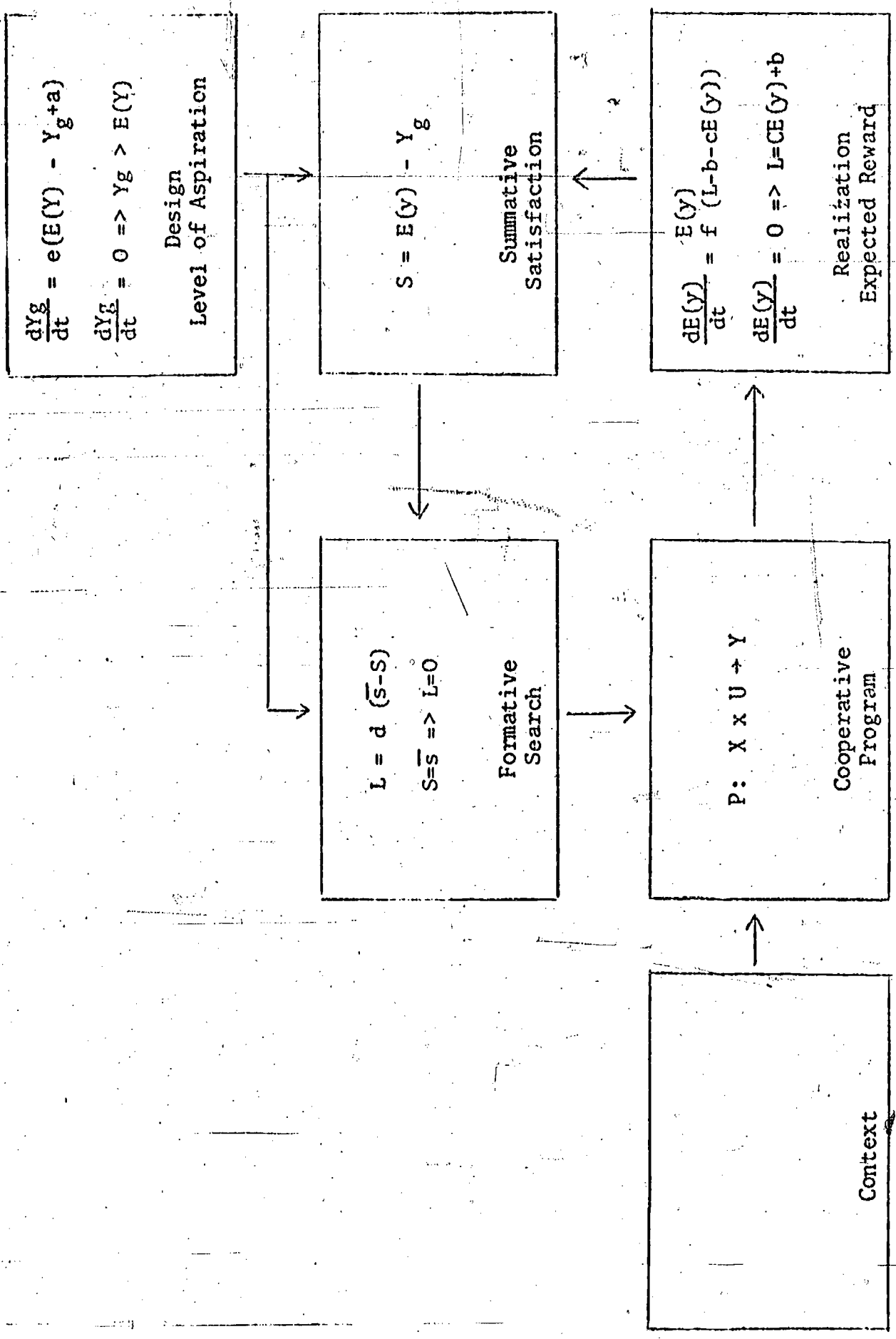


Figure 3
Adaptive Purposive Cooperative

8. The equality of level of aspiration and the expected value of reward implies a threshold or residual search.
9. The equality of satisfaction with a certain multiple (or fraction) of the residual search rate implies a cessation of search.

Section IV. Summative-Formative Contrast

A conceptual model of educational development has been synthesized which is based upon self-organizing cybernetic systems. Predicated in the self-organizing system is the elaboration of realization in accord with an adaptive policy of convergence toward a designed model-referent. Continuing scrutiny of the need for the adaptation of the policy of convergent elaboration of realization is the function of formative evaluation. The modeling of elaborated realization as an embodiment of design is summative evaluation. Confirmation of elaborated realization as an embodiment of design would be strong support for the authentication of the adaptive convergence policy. Falsification of elaborated realization as an embodiment of design would demonstrate a need to adapt the convergence policy.

It would be good to expect a convergence in the formative and summative models, but, as with experimental research on complex gases, an empirical lack of fit may become evident between the formative analogue and the summative idealization.

For simple particulate ensembles the idealization by the macro-model was fitted perfectly by the micro-model. However, complex particulate ensembles were modeled better by the micro view than by the macro view.

Nevertheless, the institutional state-space S , the formative convergence policy, P , and the realization, R , should be relatable by mapping functions $\delta: P \times S \rightarrow S$ and $w: P \times S \rightarrow Y$, for next-state, S , and output yield, Y . The entire model is that of institutional automata (P, S, R, δ, W) .

The institutional automat have a capability for self-organization through a self-renewing, adaptive planning and evaluation. Local school districts become caught up in their own sinks of decision networks, under the constraints of context, and expediencies to the extent that the (P, S, R, δ) constitute situations of undecidability. The Educational Cooperative provides an unfreezing of language, injects a transcending meta-language, and generates a new range of decidability in the problem solving, coping behavior of the school systems. The local districts will attain a stronger autogenetic posture as self-organizing automata in the hierarchical, multilevel institutional framework of education.

Autogenetic educational institutions confronted with undecidability may enrich their variety by the appropriation of specialties as black boxes of metalogic for effective completion-from-without (Beer, 1959). The Educational Cooperative is an instrument for mutual symbiotic completion-from-without with respect to the misfortunate sinks of system status and performance which reflect undecidability induced principally by the Appalachian environment (including subcultural influences).

1. Formative-Summative Contrast

The formative and summative emphases in evaluation may be elucidated by a tabular presentation of aspects and emphases, Table 1.

Table 1
Formative-Summative Contrast

Aspect	Emphasis	
	Formative	Summative
Aim	Tactics, specifications	Strategy, objectives
Emphasis	Technical efficiency	Theoretical adequacy
Scope	Fractional, infra-structure, micro-processes	Holistic, supra-structure macro-processes
Locus	Internal	External
Mode of operation	Negative feedback	Positive feedback
Decision points	Real-time	Discrete-time
User	Producer (Consumer)	Consumer (Producer)

CHAPTER 3

THEORETICAL ADEQUACY

Section I. Ordered Concerns

The evaluation of the Educational Cooperative involves at least three ordered concerns: theoretical adequacy, congruence, and program effectiveness.

Theoretical inadequacy is the selection of an inappropriate strategy. A strategy is a repertoire of variety and manipulations to influence payoff in a contest for stakes with an opponent (Ashby, 1956), in the sense of cybernetics. A strategy may include extraneous variety or exclude relevant variety and be characterized by theoretical inadequacy. The case of extraneous variety is a lack of parsimony a redundancy not preventive of strategic validity. Strategic validity is the extent to which the transmitted influence of variety is the intended influence. The exclusion of relevant variety from a strategy may prevent strategic validity from being attained.

Section II. Requisite Variety for System Decisions

Theoretical inadequacy is crucial and justifies an intensive search to preclude a premature closure on criterion variety, elements of satisfaction with realization in reference to the design model. Ashby's principle of requisite variety states that variety can be driven down only by variety in the control or regulator (Ashby, 1956). Haberstroh (1965) has given this principle a high recommendation for organizational design. The control of realization requires a repertory of variety large enough to squelch noises and disturbances.

An autogenetic, self-organizing institutional system may be subjectable to undecidability through improper attention to requisite variety. For the Educational Cooperative, this could be tantamount to forfeiture of the completion-from-without which is so crucial to the metalogic of the morphogenesis of Appalachian school systems. The variety must be permissive of mappings of characteristic computable functions translating micro policy and the states of Educational Cooperative into macro realization.

The universe of decisions includes four subsets: planning, structuring, implementation, and recycling. These system decisions are generalizable across all decision subsystems of the Educational Cooperative.

1. Planning Decisions

The formulation of objectives constitutes a system decision subset relative to the operation of each decision subsystem. The delineation, gathering, and providing of information to fund planning decisions is context evaluation. This information pertains to intended ends of the decision subsystem. The principal issue is incompleteness requiring strategic shifts in the goal-structure of the design. A functional closure may be certified to be embodied in the design as well as engender a repertoire of strategic shifts.

2. Structuring Decisions

System decisions on each decision subsystem pertaining to intended means are to be made. The fundamental concern of a structuring decision is the design. The principal issue is consistency, and the modality of information is input evaluation.

3. Implementation Decisions

Means and actual effects are coupled in system decisions on the decision subsystems. Concern is for program operations. The delineation,

gathering, and providing information to fund implementation decisions pertaining to each of the decision subsystems is process evaluation. The principal issue is controllability; that is, the problem is the manipulation of states to generate a transition sequence to create consequent target states.

4. Recycling Decisions

Recycling decisions on the decision subsystems of the Educational Cooperative constitutes a congruence judgment between actual realization and ends, that is between consequent and consummatory states. The delineation, gathering, and providing of information pertaining to recycling decisions is product evaluation. The principal issue is observability; that is, the problem is the identification of antecedent states from an observation of outputs over a finite time interval.

5. Criterion Model

Technical deficiency is incongruence between design and realization. Design incorporates desirable features into a model, a representation of desired existence. Elaborated realization is the actual existence attained in continuous reference to the correspondent design model. A design for the Educational Cooperative includes descriptive and performance constraints, or designed syntality and designed synergy, respectively. Syntality is the set of ensemble characteristics for a group or organization, such as an Educational Cooperative. Synergy is the subset of syntality encompassing dynamic features of the ensemble. Realized syntality of an Educational Cooperative may be discrepant from modeled syntality: inclusion, control, fiscal investment, Cooperative rationality, and regionality. Realized synergy of an Educational Cooperative may not sufficiently reflect modeled

Table 2
Decision Variety

	System	Planning	Structuring	Implementation	Recycling
<u>Decision Subsystem</u>					
<u>Process</u>					
Needs Assessment					
Planning					
Programming					
Evaluation					
<u>Structure</u>					
Policy Making					
Business Management					
Personnel Management					
Information System					
<u>Institutional</u>					

synergy: program cost-effectiveness, local rationality, resource reallocation, and resourcefulness.

Criterion properties are those characteristics of a thing with sufficient import to be used for judgmental anchors of satisfaction, and they may be constituted as complex aggregates of more atomistic components. A criterion property may be an attribute, present or absent, devoid of decomposable elements. On the other hand, a criterion property may be a scalable compound representable by the degree and extent of its presence. Criterion properties underwrite the specifications of an Educational Cooperative, and evaluation is consequential to the primitive concept of a basis for satisfaction (Hemphill, 1967) relative to such properties.

Malcolm Provus (1970) has defined a criterion model as "that ideal view of the world or some minute aspect of the world that man employs to understand, explore, or shape his 'real' world." A domain of relevant variables is mapped for realization. Attributes and variables conceptualize the presence and extent of characterization of entities by properties. Properties with a significant basis for satisfaction with existence or degree of presence are designated criterion variables and attributes (Horst, 1965).

The elaboration of a criterion model involves the identification and designation of variety as the bearers of relevant information of social significance. A generalized classification of variety, attributive and variable, has been described by Dubin (1969). Dubin (1969) has defined the following types of units: enumerative, associative, relational, statistical, summative, and complex.

The acceptance of variables and attributes (properties) as relevant facets of a criterion model must consider the scales of measurement (Stevens,

1959) as well as the property as a concept (or unit) per se. Stevens set down four basic scales for four basic empirical operations, viz: nominal, ordinal, interval, and ratio.

An Educational Cooperative, as a complex entity, has numerous properties. Those properties essential to the elaborated realization of the Educational Cooperative have been given in the form of specifications. Actually, the specifications demarcate the boundaries of the domain of a relevant criterion model. In other terms, specifications invest selected properties with relevant importance in the idealization of the "real" world.

Any technical deficiency for any variable would be demonstrative of stress in elaborated realization. Such demonstrated stress would ensue in the modification of the adaptive policy on convergence toward the given design model-referent to relieve such stress and assure a greater embodiment of design in elaborated realization. Falsification of the embodiment of design in elaborated realization as a demonstration of stress, a technical deficiency, should trigger a coping behavior directed at formative convergence. An ultimate case of summative modeling would be a thorough authentication of the embodiment of design in elaborated realization within the criterion thresholds and sensitivities on satisfaction. In this respect, summative evaluation encompasses a continuing concern with the formative interface of modifying the policy of converging realization toward design, and is not a distant penultimate requiem. Authentication of aspects of the realization may take place, for example, relative to inclusion as a criterion variable, along the trajectory of elaboration near the origin, whereas, with regard to another channel of variety, authentication may not be conceivable except at the terminal of the trajectory.

Criterion variety must be capable of strategic validity despite noisy disturbers. Criterion variables have direct, noisy disturbances referred to as contingency variables. The dismissal of relevant variety from selected strategy may reduce strategic validity, especially in a prescriptive construction on criterion variety and arbitrary nullification of contingency effects. Any independent, operational indicators of criterion variables have noisy disturbers called suppressors, and they deserve some consideration, Figure 4.

Embedding, operating, and testing an organization is a complex enterprise and could demand a complex variety to achieve meaningful evidence of the effect of design. Requisite variety, with strategic validity, is critical to the evaluation of the Educational Cooperative. Theoretical inadequacy is conceivable in such a complex enterprise. If the Educational Cooperative can fail, even so can the evaluative effort fail. A premature closure on criterion variety could lead to theoretical inadequacy and worse--a theoretical inadequacy to cope with theoretical inadequacy.

Disturbers should be ignored in an early evaluative effort, Figure 5. In the event that technical deficiency or theoretical inadequacy become evident in the development of Educational Cooperatives, criterion variety may be reexamined with respect to strategic validity. This is what might be construed as a reserved closure on criterion variety. Accordingly, attitudes values, personal constructs, and risk-taking behavior, and other such disturber variables are to be ignored in the early evaluation of the Educational Cooperative, especially as accentuated fundamentals.

6. Variety Map

A set of correspondences between classes of variety and organizational levels establishes a map for facet analysis. Conceptualization of the

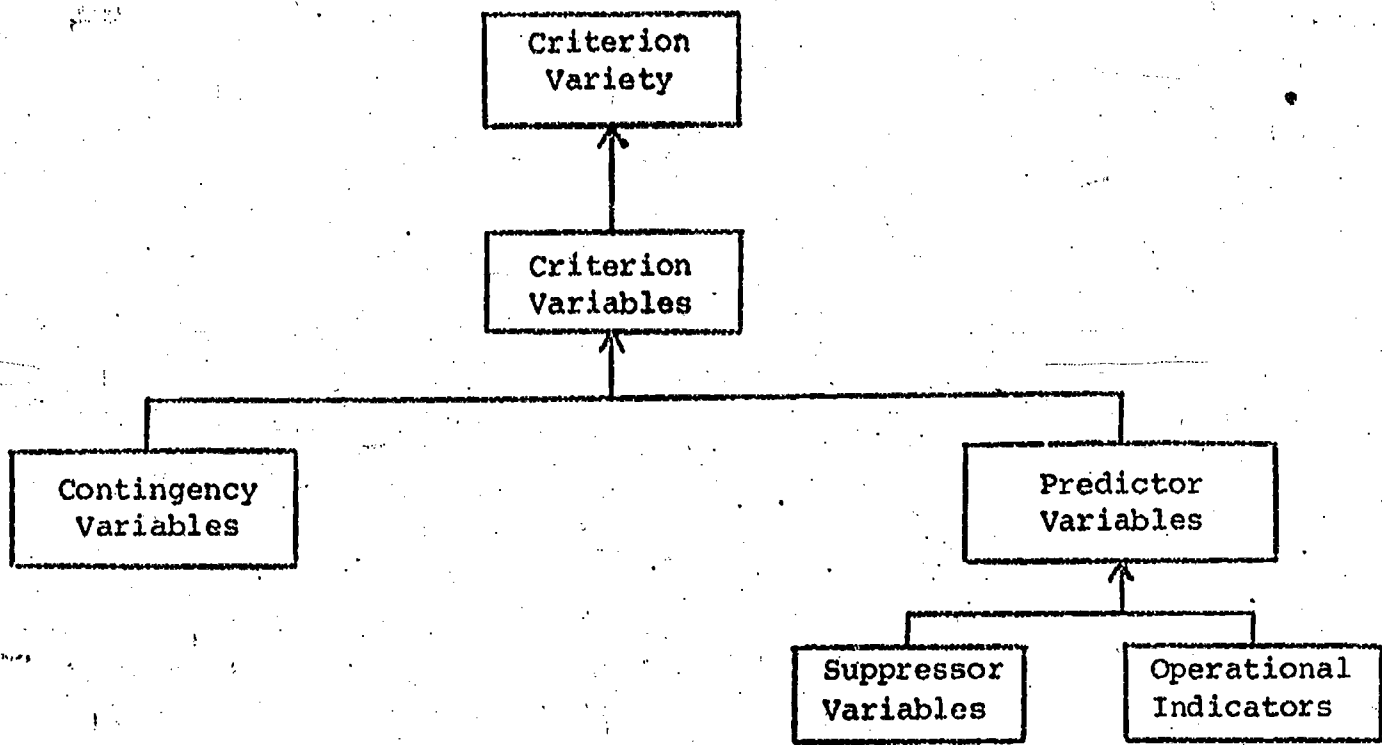


Figure 4
Criterion Variety

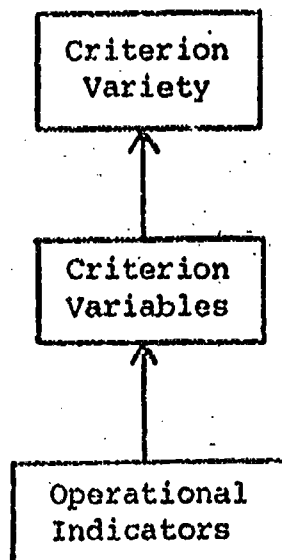


Figure 5
Operational Indicators

evaluation model allows sufficient specificity of criterion variables and operational indicators in their correspondences with activity events and tasks, respectively, to allow for state minimalization. Criterion variables represent the product decision satisfaction - controls and the operational indicators are the actionable, manipulatable metrics under constant search by formative evaluation.

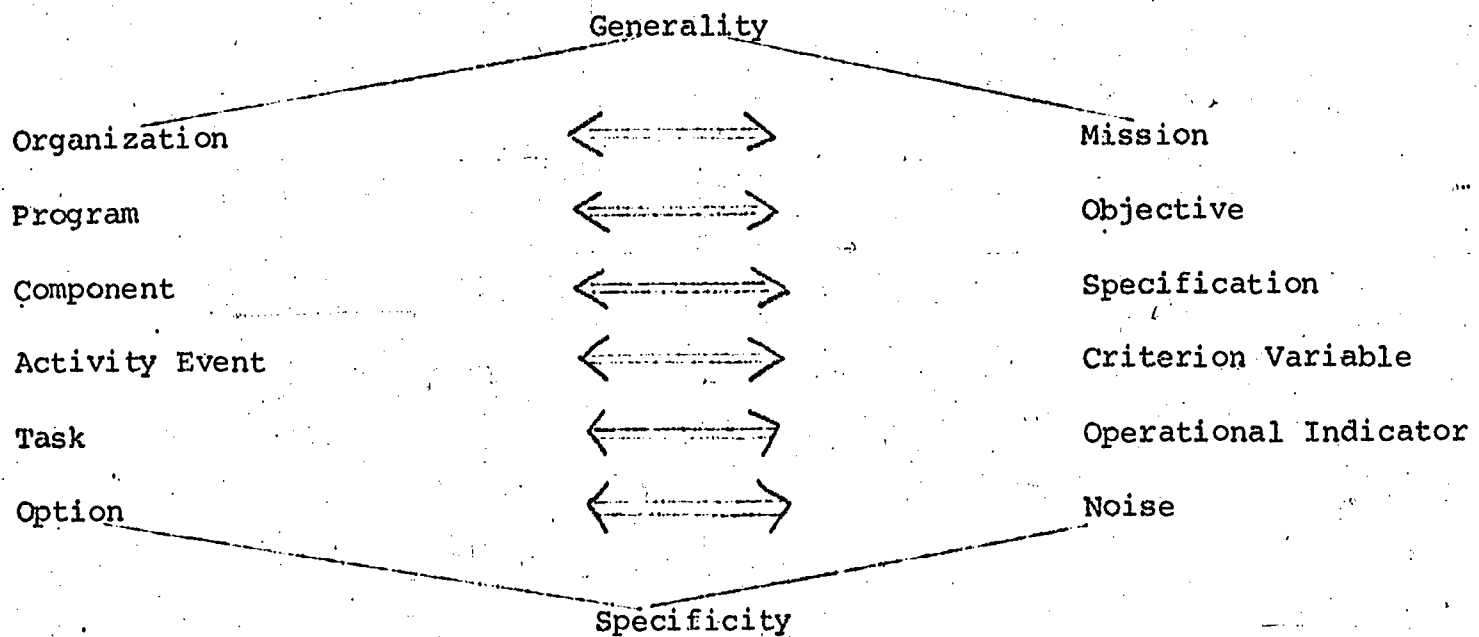


Figure 6

Organizational Design Correspondence
Generality-Specificity Continuum

Section V. Information Universe

1. Model-Theoretic Basis

The information universe for system decisions includes four subsets, namely, incompleteness, consistency, controllability, and observability.

A model-theoretic basis for submodel construction in organizational management systems design for educational enterprises is a framework for the elaboration of information subsystems crucial to goal-attainment. Substantive variety, uncertainty, redundancy, linkage configuration, state transitions, and reliability are elementary to the construction of submodels for the organizational management system of the field test to enable school superintendents to cope with multi-district problems (for example, needs assessment, planning, curriculum programming, evaluation). A model-theoretic basis for submodel construction enhances the likelihood of the adequacy of the development of organizational management.

A model-theoretic basis for submodel construction in organizational management systems design is the minimal dimensionality of substantive requisite variety crucial for the adequacy of the representation of subsystems of the referent enterprise. Substantive requisite variety is distributed in four subspaces of incompleteness, consistency, controllability, and observability. Organizational management submodels conceptualize elements, relationships, uncertainties, redundancy, linkage configurations, state transitions, and systems reliability in these subspaces.

The organizational management system design elaborates a process and structure for a viable regional educational agency. The process is a problem solving algorithm: needs assessment, planning, programming, and evaluation. The structure is a persisting pattern fundamentally supportive

of the process: information systems, policy making, personnel management, business management, and institutional relations. An intensive evaluation design for the field test must include special submodel construction to conceptualize substantive variety in terms of criterion variables, operational indicators, and acceptance levels. Process and structure submodels are to be constructed with reference to the model-theoretic basis (in mutual transactional development).

The problem solving process of the organizational management system was partitioned into a linear sequence of needs assessment, planning, programming, and evaluation. An information-theoretic conceptualization of this channel, in terms of uncertainties and reliabilities, underscores unmultiplexing redundancy in organizational management. Problem channel capacity of an organizational management system is to be well defined with appropriate substantive variety. Submodel construction elaborates requisite systems design reliability for satisficing institutional attainment of objectives. Error in institutional attainment is subject to being made arbitrarily small via redundancy. A specific result of submodel construction is the representation of specific redundancies to increase institutional reliability and reduce uncertainty.

2. Well-Defined Correspondences

A model-theoretic basis for submodel construction in organizational management systems design is well defined in the following correspondences.

- a. Incompleteness: adaptation, context evaluation, and planning decisions.
- b. Consistency: integration, input evaluation, and structuring decisions.
- c. Controllability: pattern-maintenance, process evaluation, and implementation decisions.

- d. Observability: goal-attainment, product evaluation, and recycling decisions.

A well defined model-theoretic basis is a learning strategy. Well defined submodels represent the nodal-dominance redundancies and uncertainties of the linkage distribution of organizational management crucial to institutional goal-attainment. Alternative submodels of organizational management for planned change in educational enterprises may be constructed with a model-theoretic basis for an information field.

Incompletedness Information. Incompletedness encompasses the reflection of a logic upon itself to disclose an inadequate closure. A crack in the wall of the autonomous composure of a predicate calculus for action is persuasive of justifiable permeability or completion from without. The universe of criterion variables in the design calculus is subject to strategy shifting: elimination, combination, transfer, modification, and simplification. Operational indicators are characterized by the same reservations: tactical shifting (appropriate for formative evaluation). Acceptability levels for product decisions concern channel capacity and boundary shifting. A fundamental product decision based upon incompletedness information is in terms of a criterion of maturity. What conditions and circumstances emit the predication of a "mature Educational Laboratory" or "mature Educational Cooperative?"

Consistency Information. The integration of subsystems and the coherence of design is attended to in criterion redundancy, multiplexing indicators, and reliability of criterion levels for product decisions.

Controllability Information. The manipulation of state-transition sequences, or next-state mappings is consequent upon product decisions based upon information about implication, connectedness, and transformation.

Such information is designated controllability information. The operational indicators, subject to formative search and manipulation, may be principal shapers, preventers, and encodable affecters. A manipulatable indicator may have an impulse-response function relative to its including criterion subsystem, and this impulse-response controllability information may reduce the uncertainty attendant to a product decision. Acceptability levels on criterion variables involve the performance index relating terminal error, instantaneous error, and control cost; satisficing boundaries (or optimizing maxima); and ambiguity. - Ambiguity is the uncertainty of the output given the input.

Observability. Observability information is delineated, gathered, and provided in product evaluation to make product decisions. The decipherable operability of criterion variables is a matter of concern. A criterion construct must be subject to ascertainment. A criterion event must be witnessable. Antecedent states must be inferable from a finite output sample. Operational indicators must have decodable effects to subserve fault assignment in convergence policies. Acceptability levels for criteria of success would include attention to fail-safe and equivocation. Fail-safe ensures safety due to warning system failure. Equivocation is uncertainty of input given the output.

Table 3

Requisite Variety for Systems Design and Evaluation

<u>Variety</u>	<u>Information</u>	<u>Controllability</u>	<u>Observability</u>	<u>Incompletedness</u>	<u>Consistency</u>
<u>Criterion Variable</u>	Implication Connectedness State-transitions (next state mapping)	Decipherability Output transformation (output mapping) Criterion of Success	Strategy shifting (eliminated, combined, transferred modified, simplified) (inaccessible variables) Criterion of Maturity	Redundancy	
<u>Operational Indicator</u>	Shaping dependency Preventer Encodability Impulse-response function	Fault assignment Decodability	Tactical shifting (Eliminated, combined, transferred, modified, simplified)	Multiplexing	
<u>Acceptability Level</u>	Ambiguity Satisficing (Optimizing) Performance Index	Equivocation Fail-safe	Capacity Boundary Shifting	Reliability	

CHAPTER 4

METHODOLOGICAL ADEQUACY

Section I. Instrumentation

Instrumentation is the invention or adaptation and utilization of devices to enable delineated information to be gathered. System decisions on the decision subsystems of the Educational Cooperative may require information on the adequacy, readability, and desirability of content. Also, the information could appertain to existence, desirability, and probability measures to states of the Educational Cooperative consequent to the operation of the decision subsystems.

The instruments should provide for content validity, have parallel forms whenever possible, and have concurrent measures if practical in the state of art. Content validity should receive consensual certification on functional readiness from the Cooperative staff, the evaluator, and expert consultants. Parallel forms should be developed after the first application of the instrumentation. Concurrent measures should be considered upon recommendation by consultants or staff. The instrumentation should gather information adequate for system decisions on the decision subsystems structure and process of the Educational Cooperative. A preliminary set of such instruments is provided in the appendices.

1. Mundane Existence

Current knowledge of the Cooperative, as gleaned through field activities, is apparently not refined to the extent necessary to be able to firmly state standards and levels of criterion variables and operational indicators except highly tentative trivial thresholds. Systematic observation of proposed

Table 4
Instrument Specifications

	System	Planning/ Incompleteness	Structuring/ Consistency	Implementation/ Controllability	Recycling/ Observability
<u>Decision Subsystem</u>					
<u>Process</u>					
Needs Assessment					
Planning					
Programming					
Evaluation					
<u>Structure</u>					
Policy-Making					
Information System					
Personnel Management					
Business Management					
<u>Institutional</u>					
Organizational-Set					

criterion variables and operational indicators to confirm existence appears to be a promising avenue to prime successive approximation to meaningful standards with reserved closures and revisions. One of the earliest concerns of a mathematician, for example, is the proof of an existence theorem central to the legitimation of further conceptualization. The first pass of evaluation on the field test should be proof of existence in terms of presence evidenced through criterion variables and operational indicators. The basic existence problem of quantification would allow possible inferences, elicit implications, and seek clarification contributing to discovery of acceptable threshold levels of satisfaction. There is an x as an element of the Cooperative, C , such that $y=f(x)$; that is $\exists x(y=f(x) \mid x \in C)$.

An aspect of the pursuit of a confirmation of existence as the first pass in the evaluation effort is the status of the decision subsystems detailing structure and process. Those decision subsystems suggest implicitly that closure on criterion variables and operational measures must be extremely cautious broad strokes. Conceptual clarifications and refinement in the development of the decision subsystems establish the details of operational indicators of the criterion variables. For example, in the planning subsystems the "setting of priorities" calls for behavioral detail which is crucial to operationalizing the indicators for the criterion of rationality.

An increase in the level of complexity is suggested in reference to Stufflebeam, et al. (1971, p. 69):

"Evaluation systems to support neomobilistic decision making usually are ad hoc, non rigorous investigations in the early stages of the change effort. A premium is placed upon creativity, and the studies are often exploratory and heuristic in nature. However, in later stages of the neomobilistic change effort rigor becomes the sine qua non."

In other terms for the evaluation of the Educational Cooperative a loose nearly mundane field research stance is necessary. The tone of

neomobilistic planned change one octave higher than mundane research satisfices with the existence of events and activities included in design.

2. Multiplexing Variety

The first evaluation must include the ontological divergence of variety from some transformation may distill a viable criterion model of the Educational Cooperative which will be reflected in a morphogenetic formative development in Cooperatives and strategic shifts in design.

Initial efforts to attain an evaluative capability for the Educational Cooperative would define a minimal basis for satisfaction with elaborated realization as the embodiment of design. The satisfaction gauges are criterion variables. The criterion variables are comparable to factors in a multivariate space. Each criterion variable is an information channel multiplexed by the variety of a subset of the multivariate space. Factor analytic techniques commence with variety space and delineate the multiplexed channels of the factors. The criterion variables are the multiplexed channels of satisfaction, and the approach is the reverse of the factor analytic technique: an expanded variety subspace is sought out for the criterion variables to generate a variety universe for authentication of realization.

The variety multiplexing criterion variables is to be operationalized. Operational detail in the primal phase of the confirmation of existence would be a limited behavioral prescription for the evaluator, with identification, categorization, enumeration, and rudimentary quantification very obvious. As the evaluation of the Cooperative structure and process develops, behavioral detail of the Cooperative would be incorporated into the operationalization of indicators of the criterion variables. This is an aspect of successive approximation to an appropriate universe of summative variety for the evaluation of the Cooperative.

3. Operationality

Operationalization must be based on observable evidence--existing, available, and accessible. Equally competent evaluators should be able to observe the evidence in reproducible and recurrent inspections. Written documentation, records of communication, transactions, and agreements, would, for example, take formal precedence as a general rule over verbal information. The level of formal evidence to be demanded for operational indicators, should not be expected to be more than what would mesh in with the signal-to-noise levels tolerated by the exclusion of variety--contingency and suppressor variables, pertinent to human parameters and the informal organization.

Section II. Formative Revision

The instrumentation should be developed as a by-product of the Educational Cooperative in such a manner as to be diffusible upon completion of the evaluation. However, the primary purpose of the instrumentation is for the evaluation of the Educational Cooperative. Learnings from the evaluation may result in formative modification of design. Any strategic shift in design or positive reinforcement may suggest different information requirements which will need to be reflected in instrumentation.

1. Matrix Sampling

Single organism evaluation may give an intensive look at organizational management in a regional educational agency, but conventional instrument validation may be strained. A viable supplement for this limitation on instrumentation is matrix sampling. A sample of Cooperative-type agencies, e.g., several from each category along the Hughes-Achilles (1971) spectrum of Cooperatives, could be brought into a reciprocal sharing agreement to refine the instruments, get comparative information, and advance limited release copies to

participating institutions in conjunction with consultancy or technical assistance germane to the decision subsystem and instrumentation involved.

2. Organization Taxonomic Unit (OTU)

A taxonomy of system decisions coupled with a taxonomy of structure and process decision subsystems of the Educational Cooperative gave specifications for instrumentation. Neither taxonomy is based upon direct observational data. An observational reporting schema using OTUs would enable a check to be made on the adequacy of both taxonomies. The data could be coded and analyzed by the taxa for decision making, compliance, bureaucracy, and systems theory. A simple percentage comparison of the binary data would reflect the relative adequacy to manage the data.

3. PERT

Criterion events are loosely distributed along a time line in the decision subsystems of the Educational Cooperative. The network of events needs to be firmed up to enable a meaningful analysis of system states. The event configuration provides instantaneous state compositions, sequences, and paths. A highly detailed, consensual PERT diagram would provide the basic information for an analysis of the system states of the Cooperative. The modified-PERT diagram would be a clinical projective-type evaluative instrument.

4. Minutes Analysis

The contents of the minutes of the Boards of local school districts and Cooperatives are to be coded and analyzed. The taxa or coding categories and a coding form constitute an instrument for this purpose.

Section III. Analytical Techniques

1. General

Analytical methods will include frequency and percentage tabulations and graphic displays on process and structure; graph-theoretic modeling; automata modeling; state-space systems representation; and satisficing decision analysis. The data is to be gathered with instruments given in the appendices.

2. Frequency and Percentage Analysis

Items of instruments to gather information about the structure and the process will be grouped into meaningful clusters of actionable significance. Frequencies and percentages of congruence with design will be indicated for each field test.

3. Graph-theoretic Modeling

Alternative graph-theoretic models and submodels for hierarchical, multi-level organizational management are to be constructed from the data gathered by instruments (See appendices). Species of organizational management are to be evidenced in alternative nodal-dominance configurations. Substantive variety, uncertainties, redundancies, linkage configurations, and reliability are to be synthesized into construable models of development, degeneracy, evolution, and institutional maturation.

4. Automata Modeling

Design Machine. The Educational Cooperative design and operational system may be regarded as a system, S , with inputs, I , internal states, Q , output states, Z , next-state mapping functions, δ , and output mapping function, s, ω .

$$S = \langle I, Q, Z, \delta, \omega \rangle$$

Composite Machine. The design and operational system are separately composite machines, S_c .

$$\text{Let } M_i = \langle I_i, Q_i, Z_i, \delta_i, \omega_i \rangle$$

$$S_c = M_1 \times M_2 \times \dots \times M_k = \langle I, Q_c, Z, \delta_c, \omega_c \rangle$$

Show that there is an assignment function, for each major subsystem and the

macrosystem, such that

$$S = A(S_C) = \langle I, Q = A(Q_C), Z, \delta = A(\delta_C), \omega = A(\omega_C) \rangle$$

Machine Identification. Identify the real I, Q, Z, δ, ω of the operational system and the design.

Minimal Machine. The identified machine for the designed synthesis and the cooperative entity is to be separately minimalized, that is, reduced to the most parsimonious state basis.

$$Q_m \subset Q \Rightarrow S_m = \langle I, Q_m, Z, \delta_m, \omega_m \rangle$$

Equivalent Machine. The equivalence of each cooperative entity, S_F , with design S_D , is to be determined.

$$g_i \equiv g_j \text{ iff } \omega(J, g_i) = \omega(j, g_j)$$

(wherein J is input)

$$S_F \equiv S_D$$

Isomorphic Machine. The cooperative entity, S_F , is to be an isomorph of design, S_D .

$$S_D = \langle I, Q_D, Z, \delta, \omega \rangle$$

$$S_F = \langle I, Q_F, Z, \delta_F, \omega_F \rangle$$

$$f: Q_F \rightarrow Q_D$$

$$\omega_F(i, q) = \omega_D(i, f(q))$$

$$f(\delta_F(i, q)) = \delta_D(i, f(q))$$

$$i \in I, q \in Q$$

Incompletely Specified Machines. Partially mapping is productive of discrepancy, incongruence, and technical deficiency. Partial mapping may be incompletely δ -specified, incompletely ω -specified, and incompletely $\delta\omega$ -specified.

δ -specified: subset IXQ into Q

ω -specified: subset IXA onto Z

Cooperative entities may tend toward incompletely specified machines.

Composite Machines. Cooperative entities may tend to convert the design machine into a submachine, M_i , and be a composite, S_c , of an operational system and another reference system.

$$M_i = \langle W^i, U^i, Y^i, \delta_i, \omega_i \rangle$$

(wherein $i = 1, 2, \dots, K$)

$$S_c = M_1 \times M_2 \times \dots \times M_K = \langle I, Q_c, Z, \delta_c, \omega_c \rangle$$

Find an assignment function, A, such that

$$S_D = A(S_c) = \langle I, Q = A(Q_c), Z, \delta = A(\delta_c), \omega = A(\omega_c) \rangle$$

Each Cooperative may be treated similarly as a composite of local school machines (systems).

Each Cooperative may be similarly as a composite of algorithmic process and structure machines.

The design may be treated as a composite synthesis of local machines and a composite of process and structure machines.

Submachines. The design of decision subsystems of the Educational Cooperative present the designs for submachines S_s , of the organizational management system, S_D . A submachine is shown to exist when:

$$Q_s \subseteq Q$$

$$S_s = \langle I, Q_s, Z, \delta_s, \omega_s \rangle$$

$$\delta_s(i, q_k) = \delta(i, q_k)$$

$$\omega_s(i, q_k) = \omega(i, q_k)$$

(wherein $i \in I, q_k \in Q_s$)

$$\delta_s(i, q_k) = q_j$$

(wherein $q_j \in Q_s, q_k \in Q_s$).

The analysis is to be made for each Cooperative entity and the design. Each submachine may be minimalized and analysed with respect to equivalence and isomorphism relative to design homologues.

5. State-Space Systems Analysis

The synthesis problem of system design is complemented by an identification problem. A complete identification of field test entities involves a complete statement of the state-variables, outputs, mapping functions, and matrix coefficients. The adequacy of the performance index of the system, product controllability, and observability are to be summatively determined and interpreted.

6. Satisficing

A satisficing problem involves an objective function, a tolerance function, a feasible domain of allowable decisions, and arbitrary sets. Letting X and Ω be sets of criterion variables and acceptability levels:

$$g: X \times \Omega \rightarrow V \text{ (objective function)}$$

$$r: \Omega \rightarrow V \text{ (tolerance function)}$$

The problem is to find a satisficing solution $X \in X^f \subseteq X, w \in \Omega$.

$$g(X, w) \leq r(w)$$

The satisficing criterion is represented by \leq . The satisficing problem is represented as (g, r, X^f, Ω) . All system decision information is to be provided in repertoires of alternatives observant of satisficing solutions.

Summary

The general evaluation design for the Educational Cooperative includes the delineation, gathering, and providing of information for system decisions.

Products are process and structure decision subsystems for the organizational management of an Educational Cooperative as an adaptive macro-system to facilitate educational change. System decisions include planning, structuring, implementation, and recycling. Information for these product decisions is delineated into four major categories: incompleteness, consistency, controllability, and observability. Criterion variables, operational indicators, and acceptability levels are defined for each category of decision information. The information is gathered with especially constructed instruments, and analysed for content and system behavior. Theoretical adequacy, congruence of operations with design, and effectiveness are given close consideration. The information is provided with formative and summative emphases respecting the requirements of different decision makers.

BIBLIOGRAPHY

- Alper, Paul. "Introduction of Control Concepts in Educational Planning Models," Mathematical Models in Educational Planning. Paris: Organization for Economic Cooperation and Development, 1967.
- Andrew, Gary M. and Donald E. Moir. Information - Decision Systems in Education. Itasca, Illinois: Peacock Publishers, 1970.
- Anthony, Robert N. Planning and Control Systems: A Framework for Analysis. Boston: Harvard Business School, 1965.
- Aoki, M. Optimizations of Stochastic Systems. New York: Academic Press, 1967.
- Appalachia Educational Laboratory, Inc. Descriptive Design for the Educational Cooperative. Charleston, West Virginia: Appalachia Educational Laboratory, Inc. 1971.
- _____. Educational Cooperative: Basic Program Plan. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1972.
- Apter, Michael. Cybernetics and Development. New York: Pergamon Press, 1968.
- Archibald, R. and R. Villoria. Network Based Management Systems. New York: John Wiley and Sons, 1967.
- Armitage, Peter M., Cyril S. Smith, and Paul Alper. Decision Models for Educational Planning. London: Penguin, 1969.
- _____. Models for Educational Decision Making. London: Penguin Book Company, 1969.
- Ashby, W. R. An Introduction to Cybernetics. New York: John Wiley and Sons, 1959.
- Beer, Stafford, Cybernetics and Management. New York: John Wiley and Sons, 1966.
- _____. Decision and Control. London: John Wiley and Sons, 1966.
- Bellman, Richard. Adaptive Control Processes. Princeton, New Jersey: Princeton University Press, 1961.
- Berrien, Kenneth F. General and Social Systems. New Brunswick: Rutgers University Press, 1968.
- Bertalanfly, Ludwig von. General System Theory. New York: George Brayiller, Inc., 1968.
- _____. "General System Theory - A Critical Review," Walter Buckley (ed.), Modern Systems Research for the Behavioral Scientists. Chicago: Aldine Publishing Company, 1968.

- Booth, Taylor L. Sequential Machines and Automata Theory. New York: John Wiley and sons, Inc., 1967.
- Braybrooke, D. and C. E. Lindblom. A Strategy of Decision. New York: Free Press, 1963.
- Bross, Irwin D. F. Design for Decision. New York: Free Press, 1953.
- Broudy, Harry. Criteria for the Theoretical Adequacy of Conceptual Framework of Planned Educational Change. Bethesda, Maryland: ERIC, 1965. (ED 010 914)
- Browder, Jr., Lesley H. Emerging Patterns of Administrative Accountability. Berkeley, California: McCutchan Publishing Corporation, 1971.
- Buckley, Walter (ed.). Modern Systems Research for the Behavioral Scientist. Chicago: Aldine Publishing Company, 1968.
- _____. Sociology and Modern Systems Theory. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1967.
- Campbell, Donald T. Exploration of Novel Research Designs and Measurement Techniques. Evanston, Illinois: Northwestern University, 1965. (ED 033 389)
- Campbell, Merrill G. et al. Directions for Educational Development in Appalachia. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1971.
- Carlson, Richard O. School Superintendents: Careers and Performance. Columbus: Charles E. Merrill Publishing Company, 1972.
- Center for Effecting Educational Change. Evaluation and "PACE": A Study of Procedures and Effectiveness of Evaluation Sections in Approved PACE Projects with Recommendations for Improvement. Report #1 of the second National Study of PACE. Fairfax, Virginia: Center for Effecting Educational Change, 1968.
- Cook, Desmond L. Management Control Theory as a Context for Educational Evaluation. Columbus, Ohio: The Ohio State University Educational Program Management Center, 1970.
- _____. "Management Control Theory as a Context for Educational Evaluation," Journal of Research and Development in Education, 3(4):13-26, Summer 1970.
- Croft, Don B. and Adolph J. Koenig (editors). Application of Research Management Techniques. Las Cruces, New Mexico: Special Interest Group on Research Management, New Mexico State University, 1971.
- Curtis, Dr. William H. Educational Resources Management System. Chicago: Research Corporation, 1971.
- Dubin, Robert. Theory Building. New York: The Free Press, 1969.
- Eidell, Terry L. Model for the Management and Operations Sub-System of the Educational Cooperative. Eugene, Oregon: Center for the Advanced Study of Educational Administration, 1967.

- Elgerd, Olle J. Control Systems Theory. New York: McGraw-Hill Book Company, 1967.
- Etzioni, Amitai. Modern Organizations. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1964.
- Evans, J. A. A Framework for the Evolutionary Development of an Executive Information System, Part 1, Organizational Problem-Finding. Bedford, Massachusetts: Mitre Corporation, 1970. (ED 047 729)
- _____. A Framework for the Evolutionary Development of an Executive Information System, Part 2: System Design, Implementation and Evolution. Bedford, Massachusetts: Mitre Corporation, 1970. (ED 047 730)
- Fels Institute. General Design for the Educational Planning-Programming-Budgeting System. Pennsylvania University, Philadelphia, Government Studies Center, 1968. (ED 037 812)
- Finn, James D. "Institutionalization of Evaluation," Evaluation and "PACE". Fairfax, Virginia: Center for Effecting Educational Change, 1968.
- Flament, C. Applications of Graph Theory to Group Structure. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1963.
- Gephart, William J. Criteria for Methodological Adequacy for Research on Educational Change. Bethesda, Maryland: ERIC, 1965. (ED 011 146)
- Gephart, William J. The Eight General Research Methodologies: A Facet Analysis of the Research Process. Bloomington, Indiana: Phi Delta Kappa, 1969. (ED 052 237)
- Gideonse, Hendrik D. Educational Research and Development in the United States. Washington, D. C.: National Center for Educational Research and development, U. S. Government Printing Office, 1970.
- Gordon, Rovert. "Optimum Component Redundancy for Maximum System Reliability," Operations Research, 5:229-243, 1957.
- Griffiths, Daniel (ed.). Developing Taxonomies of Organizational Behavior in Education - Final Report. New York: New York University, April, 1968. (ED 021 339)
- _____. Developing Taxonomies of Organizational Behavior in Educational Administration. Chicago: Rand McNally and Company, 1969.
- Guba, Egon G. Methodological Strategies for Educational Change. Bethesda, Maryland: ERIC, 1965. (ED 011 404).
- Habenstein, Robert W. (ed.). Pathways to Data: Field Methods for Studying Ongoing Social Organizations. Chicago: Aldine Publishing Company, 1970
- Häberstroh, Chadwick J. "Organizational Design and Systems Analysis," James G. March (ed.), Handbook of Organizations. Chicago: Rand McNally and Company, 1965.

- Haggart, Sue A. (ed.) Program Budgeting for School District Planning. Englewood Cliffs, New Jersey: Educational Technology Publications. 1972.
- Halpin, Andrew W. Administrative Theory in Education. New York: The Macmillan Company, 1958.
- _____. Theory and Research in Administration. New York: The Macmillan Company, 1966.
- Harary, Frank. "Graph Theory and Group Structure," R. Duncan Luce, Robert R. Bush, and Eugene Galanter (editors), Readings in Mathematical Psychology, Vol. II. New York: John Wiley and Sons, Inc., 1965.
- Hawkrige, David G. and Peggie L. Campeau. Developing a Guide for Authors of Evaluation Reports of Educational Programs, Final Report. Palo Alto, California: American Institutes for Research in the Behavioral Sciences, 1969. (ED 043 677)
- Hills, R. Jean. Toward a Science of Organization. Eugene, Oregon: University of Oregon Press, 1968.
- Hughes, Larry W. et al. Interpretive Study of Research and Development Relative to Educational Cooperatives, Final Report. Knoxville, Tennessee: College of Education, the University of Tennessee, 1971.
- Johnson, Richard A., Fremont E. Kast, and James E. Rosenzweig. The Theory and Management of Systems, Second Edition. New York: McGraw-Hill Book Company, 1967.
- Jones, J. Christopher. Design Methods: Seeds of Human Futures. London: Wiley-Interscience, 1970.
- Kaplan, Abraham. The Conduct of Inquiry. San Francisco: Chandler Publishing Company, 1964.
- Keeney, M. G., H. E. Koenig, and R. Zemach. State-Space Models of Educational Institutions. East Lansing, Michigan: Division of Engineering Research, Michigan State University, 1967.
- Kent, W. P., B. Davis, and W. A. LeBaron. A Preliminary System Description and Critique of the Appalachia Educational Cooperative. Falls Church, Virginia: System Development Corporation, 1967.
- Klein, S. P., J. Burry, D. A. Churman, and M. A. Nadeau. Evaluation Workshop I: An Orientation. Monterey, California: GTB/McGraw-Hill, 1971.
- Kohl, John and Charles M. Achilles. A Basic Planning and Evaluation Model for Cooperation in Providing Regional Education Services. University Park, Pennsylvania: Pennsylvania State University, 1970.
- Lessinger, Leon M. and Ralph W. Tyler (editors). Accountability in Education. Belmont, California: Wadsworth Publishing Company, Inc., 1971.
- Litterer, Joseph A. Organizations: Structure and Behavior, Vol. I. New York: John Wiley and Sons, Inc., 1969.

- Litterer, Joseph A. Organizations: Systems, Control and Adaptation, Vol. II. New York: John Wiley and Sons, Inc., 1969.
- Lutz, Frank W. and Laurence Iannaccone. Understanding Educational Organizations: A Field Study Approach. Columbus, Ohio: Charles E. Merrill Publishing Company, 1969.
- March, James G. (ed.). Handbook of Organizations. Chicago: Rand McNally and Company, 1965.
- _____ and Herbert A. Simon. Organizations. New York: John Wiley and Sons, Inc., 1958.
- Messarovic, M. D., D. Macko, and Y. Takahara. Theory of Hierarchical, Multi-level Systems. New York: Academic Press, 1970.
- Miller, Donald R. Planning, Developing and Implementing Title III, ESEA Projects. Burlingame, California: OPERATION PEP, May 1968. (ED 022 247)
- Mishkin, Eli and Ludwig Braun. Adaptive Control System. New York: McGraw-Hill Book Company, Inc., 1961.
- Neyman, Clinton A., Jr. Evaluation of ESEA Title I Programs for the District of Columbia, 1967-68, Final Report. Washington, D. C.: George Washington University, 1969. (ED 049 319)
- North Central Association. Evaluative Criteria for the Evaluation of Secondary Schools, Forth Edition. Washington, D. C.: American Council on Education, 1969. (ED 034 312)
- Ogata, Katsuhiko. State Space Analysis of Control Systems. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1967.
- Organization for Economic Cooperation and Development. Mathematical Models in Educational Planning. Paris: Organization for Economic Cooperation and Development, 1967.
- _____. Methods and Statistical Needs for Educational Planning. Paris: Organization for Economic Cooperation and Development, 1967.
- Pontryagin, L. S. et al. The Mathematical Theory of Optimal Processes. New York: John Wiley and Sons, Inc., 1962.
- Price, James L. Organizational Effectiveness: An Inventory of Propositions. Homewood, Illinois: Richard D. Irwin, Inc., 1968.
- Provus, Malcolm. Discrepancy Evaluation: For Educational Program Improvement and Assessment. Berkeley, California: McCutchan Publishing Corporation, 1971.
- _____ and G. Edward Lundin. "Evaluation for Administrative Action," Journal of Research and Development in Education, 3(4):1-108, Summer 1970.

- Roberson, E. Wayne (ed.). Educational Accountability Through Evaluation. Englewood Cliffs, New Jersey: Educational Technology Publications, 1971.
- Roë, A. An Adaptive Decision Structure for Educational Systems. Berkeley, California: University of California, 1963.
- Rudwick, Bernard H. Systems Analysis for Effective Planning: Principles and Cases. New York: John Wiley and Sons, Inc., 1966.
- Sanders, James R. and Blaine R. Worthen. "A Descriptive Summary of Frameworks for Planning Evaluation Studies," SRIS Quarterly, 5(1):10-14, Spring 1972.
- Scriven, Michael et al. An Evaluation System for Regional Labs and R&D Centers/ Washington, D. C.: USOE (NCERD), 1971.
- Shannon, C. E. "A Mathematical Theory of Communication," Bell System Technical Journal, 27:379-423, 623-656, 1948.
- _____ and W. Weaver. The Mathematical Theory of Communication. Urbana, Illinois: University of Illinois Press, 1949.
- Stake, Robert E. "PACE Evaluation," Evaluation and "PACE". Fairfax, Virginia: Center for Effecting Educational Change, 1968.
- Starr, Martin Kenneth. Product Design and Decision Theory. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1963.
- Stephens, E. Robert et al. The Multi-County Regional Educational Service Agency in Iowa, Summary Report. Iowa City: Iowa University, 1967.
- Stepp, Ermel, Jr. Planning Educational Systems Control: A State-Space Model of Strategic Factors. Ann Arbor: University Microfilms, 1971.
- _____. General Systems Decisions in Educational Development. A revised version of a paper presented to the annual meeting of the Special Interest Group on Research Management, American Educational Research Association, New Orleans, Louisiana, February, 1973.
- Stufflebeam, Daniel et al. Design for Evaluating R&D Institutions and Programs/ Washington, D. C.: USOE (NCERD), 1971.
- _____. Educational Evaluation and Decision Making. Itasca, Illinois: F. E. Peacock Publishers, Inc., 1971.
- Taylor, Donald W. "Decision Making and Problem Solving," Handbook of Organizations, James G. March (editor). Chicago: Rand McNally and Company, 1965.
- Temkin, Sanford. A Comprehensive Theory of Cost-Effectiveness. Philadelphia: Research for Better Schools, Inc., 1970. (ED 040 503)
- Tracz, George S. "An Overview of Optimal Control Theory Applied to Educational Planning." Paper read at the American Educational Research Association, Los Angeles, California, 1969. (ED 030 189)

Tyler, Ralph W. (ed.): Educational Evaluation: New Roles, New Means. The Sixty-eighth Yearbook of the National Society for the Study of Education. Chicago: The National Society for the Study of Education. June, 1970.

USOE. Testing and Further Development of an Operational Model for the Evaluation of Alternative Title I (ESEA) Projects. Washington, D. C.: Office of Education (DHEW), 1968. (ED 032 757)

Von Neumann, John. "The General and Logical Theory of Automata," Cerebral Mechanisms in Behavior. New York: John Wiley and Sons, Inc., 1951.

_____. "Probabilistic Logics and the Synthesis of Reliable Organisms from Unreliable Components," Automata Studies. Princeton, New Jersey: Princeton University Press, 1956.

Webb, Eugene et al. Unobtrusive Measures: Non-reactive Research in the Social Sciences. Chicago: Rand McNally and Company, 1966.

Weiner, Norbert. Cybernetics: Communication and Control in the Animal and the Machine. New York: John Wiley and Sons, Inc., 1948.

_____. The Human Use of Human Beings: Cybernetics and Society. New York: Doubleday and Company, Inc., 1954.

White, Ernest R. A Comparative Analysis of the Administrative Structure and Operation of Educational Cooperatives. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1968.

Wilcox, Hayes et al. The Educational Cooperative: A Design for a Regional Educational Agency. Charleston, West Virginia: Appalachia Educational Laboratory, 1974.

Worthen, B. R. and J. R. Sanders. Educational Evaluation: Theory and Practice. Worthington, Ohio: Charles A. Jones (in press).

Young, Stanley. Management: A Systems Analysis. Glenview, Illinois: Scott, Foresman and Company, 1966.

Zemach, Rita. A State Space Model for Resource Allocation in Higher Education. East Lansing: Division of Engineering Research, Michigan State University, 1967.

Appendix A

Needs Assessment in the Educational Cooperative:
An Evaluation Instrument

Assessment of Educational Discrepancies

1. Objectives of needs assessment include(d):

- a. identification of client's behavioral repertoire at the completion of:
 - (1) preschool
 - (2) Primary
 - (3) intermediate
 - (4) secondary
- b. identification of client's behavioral repertoire at varying levels of education among divergent
 - (1) educational agencies
 - (2) public agencies
 - (3) professionals
 - (4) community groups
- c. identification of client's behavioral repertoire at varying levels of education as evidenced by
 - (1) school data
 - (2) perceptions of divergent educational and public agencies, professionals, and community groups
- d. reporting of results of comparative analysis to local school boards for purpose of decision making regarding further Cooperative action
- e. providing continuing means for assessing outputs:
 - (1) expected
 - (2) existing

2. Major assessment activities include(d);

- a. identification of sources of output indicators
- b. identification of output indicators
- c. determination of output expectations per indicator per level of education
- d. classification of indicators by taxonomy of educational objectives

- e. design of instruments to determine community expectations
- f. sampling procedures for assessing community expectations
- g. identification of sources for determining existing outputs
- h. design of instruments to determine existing outputs
- i. sampling procedures for assessing existing outputs
- j. orientation of data collectors
- k. collection of data
- l. preparation for data analysis
- m. comparison of observed and expected data
- n. definition of discrepancies
- o. reporting findings to:

- (1) local school boards
- (2) Cooperative boards

3. Sources of indicators for expectations were identified and gathered.

- a. a goal-stipulation scheme was generated.

- (1) characteristics of goals were stipulated (e.g., nature, content, and source)
- (2) policy guidelines for goal-stipulation were written, approved by the Board, and used
- (3) programmatic recommendations were made

- b. Local school systems were used as sources.

- (1) achievement tests and scores
- (2) curriculum guides and materials
- (3) stated educational goals and school board policies
- (4) school personnel
- (5) school clients

- c. state department of education

- (1) state needs assessment

- (2) studies (e.g., committees, commissions)
- (3) budget reports
- (4) hearings
- (5) program objectives and guidelines
- (6) legislation

d. Federal

- (1) national needs assessment findings
- (2) publications (e.g., Educational Daily, Congressional Record)
- (3) ~~program objectives and guidelines~~
- (4) current priorities (e.g., directives, speeches)
- (5) congressional committee reports
- (6) White House Commissions

e. Planning District

f. local individuals and groups

g. local publications

h. professional publications

- (1) teacher
- (2) administrator
- (3) accreditation
- (4) fraternal and/or learned societies
- (5) journals focusing on region
- (6) future projections
- (7) trade magazines
- (8) school board associations

i. observation and community data

4. Content analysis was used as a basis for inference in order to identify output expectations from sources.

a. categories of statements were used.

(1) policy (general purposes)

(2) educational goals (general targets)

(a) input goals

(b) process goals

(c) output goals

(3) educational objectives (timed)

(a) program objectives

(b) curriculum objectives

(c) instructional objectives

(4) individual and group values

b. inferences were made.

(1) indicators of output expectations were arranged in a hierarchical, general-to-specific branching pattern.

(a) policy

(b) goal

(c) program objective

(d) curriculum objective

(e) instructional objective

5. Expectations were classified by level of education.

a. primary

b. intermediate

c. secondary

d. post-secondary

6. Expectations were classified according to a taxonomy of educational objectives.

a. cognitive

(1) knowledge

(2) comprehension

(3) application

(4) analysis

(5) synthesis

b. affective

(1) receive

(2) respond

(3) value

(4) organization

(5) characterization

c. psychomotor

(1) imitation

(2) manipulation

(3) precision

(4) articulation

(5) naturalism

7. Instruments were designed to determine community expectations.

a. Specific output indicators were established.

b. Populations were sub-setted for assessing community expectations.

(1) economic status

(2) specific interests

(3) governmental agencies

(4) age groups

(5) immediate clientele

(6) occupation

c. A type of instrumentation was established to solicit expectations.

d. An item-bank was established to solicit responses.

- e. Instrumental format was planned.
 - f. Instruments were validated.
8. Sampling procedures for assessing community expectations were completed.
- a. The size(s) of the sample(s) was/were determined.
 - b. The most appropriate sampling procedure was determined (e.g., random, stratified, or cluster).
9. Instruments were designed to determine existing outputs.
10. Populations were subsetting for assessing existing outputs.
11. Sampling procedures were completed for existing outputs.
12. Data collectors were oriented.
- a. instrumentation
 - b. time
 - c. place
 - d. disposition of data
 - e. manager's responsibilities
13. Data collection was completed or planned.
14. Preparations were made for data analysis.
- a. Data were verified.
 - b. Data were coded.
 - c. Data were organized appropriately for analysis.
15. Expected outcomes were compared with observed data.
16. Discrepancies were defined.
- a. Data-based discrepancies were affirmed.
 - b. School system comparisons were made.
 - (1) differences (contrasts)
 - (2) similarities
 - c. Sub-population profiles were constructed and interpreted.
17. Assessment findings were reported to the Boards.

- a. Cooperative Board
 - b. local school boards
18. Continuous Needs Assessment was provided for via various mechanisms.
- a. periodic inventories (e.g., annual, semi-annual)
 - b. content analysis of new documents and reports
 - c. recording of informal communications
 - d. monitoring of ongoing programs.

Formulation of Educational Problems

19. Objectives in problem formulation included:
- a. identification of existing program components and interrelationships associated with discrepancies
 - b. determination of environmental characteristics associated with discrepancies
 - c. determine deficiencies in existing program efforts
 - d. translate known deficiencies into problem statements
 - e. report problems to the Board.
20. Essential major activities were carried out in formulating educational problems.
- a. Characteristics of the target population were identified.
 - (1) socioeconomic
 - (2) cognitive
 - (3) affective
 - (4) conative
 - (5) psychomotor
 - (6) physical
 - b. Existing and desirable program inputs were identified.
 - (1) program costs
 - (2) subject content

- _____ (3) media employed.
- _____ (4) mediator characteristics
- _____ (5) time inputs

_____ 21. Existing environmental conditions were identified.

- _____ a. home
- _____ b. community
- _____ c. school

_____ 22. Existing or desirable program procedures were identified.

_____ 23. Models of existing or desirable program procedures were constructed.

- _____ a. Major components were identified.
- _____ b. Component relationships were established.

_____ 24. Problem formulation groups were identified.

- _____ a. Individual characteristics were considered.
- _____ b. Representation was considered.

_____ 25. Problem formulation procedures were established.

- _____ a. Synectic processes were applied.
- _____ b. Brainstorming methods were used.
- _____ c. Fault tree analysis techniques were used.

_____ 26. Statements of probable cause of discrepancies were established.

_____ 27. Statements of problems were established.

- _____ a. Major problems were stated.
- _____ b. Sub-problems were stated.
 - _____ (1) Performance weaknesses were defined.
 - _____ (2) Performance gaps were defined.
 - _____ (3) Resource inadequacies were defined.
 - _____ (4) Procedural inadequacies were defined.
 - _____ (5) Environmental inadequacies were defined.

28. Statements were organized for ordering priorities.

Instrumentation

29. Various data gathering techniques were considered.

a. interviews

(1) types of interviews

(a) structural

(b) unstructured

(2) item types

(a) fixed alternatives

(b) open-end critical incidence

(c) scale items

(3) strengths and weaknesses

(4) procedures

b. survey questionnaires

c. objective tests

(1) types of tests

(a) intelligence (aptitude)

(b) achievement

(c) personality

(2) strengths and weaknesses

(3) procedures

d. objective scales

(1) types of scales

(a) attitude scales

(1) summative ratings

(2) equal-appearing intervals

(3) forced-choice

- (b) value scales
- (c) strengths and weaknesses
- (d) procedures (e.g., construction and administration)
- e. observation techniques
 - (1) behavior categories
 - (2) unobstrusiveness
 - (3) rating scales
 - (a) category
 - (b) numerical
 - (c) graphic
 - (4) strengths and weaknesses
 - (5) procedures
- f. projective methods
 - (1) types of projective methods
 - (a) association techniques
 - (b) construction techniques
 - (c) completion techniques
 - (d) expressive techniques
 - (e) role playing
 - (2) strengths and weaknesses
 - (3) procedures
- g. semantic differential
 - (1) basic considerations
 - (a) identification of concepts
 - (b) construction of scales
 - (c) analysis of data
 - (2) strengths and weaknesses

(3) procedures

h. Delphi

i. Educational Charrette

j. Scenario

30. Item construction was achieved to conform with

a. criteria

b. general procedures

31. Instruments were validated.

32. Instruments were reliable.

Appendix B

Needs Assessment Bibliography

BEST COPY AVAILABLE

- American Association of School Administrators. ERIC Abstracts: A Collection of ERIC Document Resumes on Educational Assessment. Washington, D. C.: American Association of School Administrators, September, 1970.
- Armstrong, Charles M. Decision Making in the Public Schools, Need Assessment. Burlingame, California: OPERATION PEP, 1968. (ED 043 945)
- Associated Educational Consultants, Inc. A Comprehensive Study of Educational Needs of the North Central Region of Pennsylvania: Cameron - Elk - McKean - Potter Counties. Pittsburgh, Pennsylvania: Associated Educational Consultants, Inc., 1968.
- Battelle Memorial Institute. Summary Report on Educational Planning for Ohio Schools. Columbus, Ohio: Ohio Department of Education, 1970.
- Bloom, Benjamin S. Cross-National Study of Educational Attainment, Stage I of the I.E.A. Investigation in Six Subject Areas, Final Report, Vol. I. Chicago: Chicago University, February 1969. (ED 034 290)
- . Cross-National Study of Educational Attainment, Stage II. Chicago: Chicago University, February 1969. (ED 034 300)
- Campbell, Merrill G. et al. Directions for Educational Development in Appalachia. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1971.
- Campbell, Vincent N. and David G. Markel. Identifying and Formulating Educational Problems. Washington, D. C.: American Institute for Research, 1967.
- Committee on Education and Labor. Needs of Elementary and Secondary Education for the Seventies, A Compendium of Policy Papers. Washington, D. C.: Committee on Education and Labor, House of Representatives, Ninety-first Congress, First Session, 1970. (ED 042 868)
- Coombs, Philip H. The World Educational Crisis. New York: Oxford University Press, 1968.
- EPIC. Needs Assessment. Tucson, Arizona: Educational Innovators Press, 1970.
- ERIC/CLEM. Educational and Social Demands on the Schools: Analysis of Literature and Selected Bibliography. Eugene, Oregon: ERIC Clearinghouse on Educational Administration, University of Oregon, September, 1970.

BEST COPY AVAILABLE

- Garms, Walter I. and Mark C. Smith. Development of a Measure of Educational Need and Its Use in a State School Support Formula, Report on Study of the New York State School Support Formula. Albany, New York: State Education Conference Board, 1969. (ED 038 739)
- Herriott, Robert E. and Benjamin J. Hodgkins. "Social Context and the School: An Open-System Analysis of Social and Educational Change," Rural Sociology. XXXIV: 149-166, June, 1969.
- Johns, Roe L. et al. Dimensions of Educational Need. Gainesville, Florida: National Education Finance Project, 1969. (ED 036 007)
- Kentucky Department of Education. Kentucky Educational Needs Assessment Study, Phase I. Frankfort, Kentucky: Kentucky Department of Education, 1970.
- _____. Kentucky Educational Needs Assessment Study (Phase II) Learner Needs. Frankfort, Kentucky: Kentucky Department of Education, 1971.
- Liu, Bangnee Alfred. Estimating Future School Enrollment in Developing Countries. Paris: United Nations Education, Scientific and Cultural Organization. 1966.
- Morphet, Edgar L. and David L. Jesser. Designing Education for the Future, Rationale, Procedures and Appraisal, Final Report and External Evaluation. Denver: Designing Education for the Future, 1969. (ED 035 078)
- Pauley, B. G. and C. O. Humphreys. Educational Needs Assessment Report. Charleston, West Virginia: West Virginia State Department of Education. 1969.
- Pennsylvania Department of Education. Educational Quality Assessment, Phase II Findings. Harrisburg, Pennsylvania: Pennsylvania Department of Education, 1970.
- PROJECT DESIGN. Brainstorm, A Sub-Project Assessing Educational Needs as Perceived by School Staff, Project Design, Interagency Planning for Urban Educational Needs, No. 1. Fresno, California: Fresno City Unified School District, 1968. (ED 038 743)
- _____. Conclusions from Needs Assessment Publications, Project Design, Interagency Planning for Urban Educational Needs, No. 29. Fresno, California: Fresno Unified School District, 1968. (ED 038 767)
- _____. Problems Perceived by Educational Leadership, Project Design, Interagency Planning for Urban Educational Needs, No. 6. Fresno, California: Fresno City Unified School District, 1968. (ED 038 748)

BEST COPY AVAILABLE

Summary Fresno Educational Needs Assessment, Project Design, Interagency Planning for Urban Educational Needs, No. 30. Fresno, California: Fresno Unified School District, 1968. (ED 038 768)

Rice, Arthur H. "What Education Needs: Neomobilistic Change," Nations Schools. 83:12, December, 1968.

Sklar, Sigmund L. and William E. Ioup. A Prototype National Educational Finance Planning Model, Projections of Educational Needs, Resources and Disparities Under Various Forecasting and Policy Assumptions. Washington, D. C.: President's Commission on School Finance, 1971. (ED 058 506)

Stanford Research Institute. Alternative Futures and Educational Policy. Menlo Park, California: Stanford Research Institute, 1970. (ED 038 358)

Stepp, Ermel et al. Educational Needs Assessment: An Evaluation Instrument. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1972.

General Evaluation Design for the Educational Cooperative Program. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1972.

Special Evaluation Submodel for Needs Assessment. Charleston, West Virginia: Appalachia Educational Laboratory, Inc. forthcoming, 1972.

Sweigert, Ray L., Jr. The First Step in Educational Problem Solving: A Systematic Assessment of Student Benefits. (ED 038 740)

USOE. Educational Needs Assessment Guidelines. Washington, D. C.: USOE, 1970.

Virginia Department of Education. Virginia Educational Needs Assessment Study, Vols. 1 and 2. Richmond, Virginia: Virginia Department of Education, 1970.

Vroon, John. Needs Assessment and Problem Formulations. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1972.

Wise, Arthur E. The Foundation Program and Educational Needs: A Conceptual Analysis. Chicago: Graduate School of Education, University of Chicago, 1971 (ED 058 482)

Woodbury, Charles A., Jr. et al. Research Model for State Educational Needs Assessment. Charlottesville, Virginia: University of Virginia, 1970. (ED 042 263)

Appendix C

Planning in the Educational Cooperative:
An Evaluation Instrument

Priorities

1. A mission statement was/has been approved for setting priorities.
2. Expected outcomes for setting priorities were/have been determined.
 - a. Educational problem statements were/have been composed.
 - b. Problem dimensions were/have been clearly accentuated for setting priorities.
 - c. Comparison information bearing on the various problems was/has been provided.
 - d. Analytical techniques and results have been properly supportive of realizing expected outcomes.
 - e. Decision rules for comparison.
3. A written rationale for setting priorities was/has been approved by the Board of Control.
 - a. A basis for setting priorities was/has been stated in purposive delimitation of program capability.
 - b. Direction by the constituency was/has been affirmed.
 - c. Responsibilities of a planner-analyst were/have been delineated, including:
 - (1) provision of necessary information
 - (2) analytical structure
 - (3) communication with the Board of Control
4. The requisite conditions for setting goals were/have been adequately analyzed.
 - a. Limits in goal setting were/have been delineated.
 - b. Constraints on goal setting were/have been delineated.
 - c. Input needs essential to goal setting were/have been delineated.
 - d. Performance capabilities of the Cooperative in goal setting were/have been delineated.
 - e. Operational activities for goal setting were/have been delineated.
5. Written criterion standards were/have been used in goal setting.

a. Written decision rules for ordering priorities were/have been used in goal setting.

- (1) Decision rules for ordering priorities were/have been formulated on relevant organizational objectives and the rationale of the Cooperative.
- (2) Decision rules for ordering priorities were/have been formulated relevant to the objectives and priorities of other agencies which have a legitimate role in establishing educational goals.
- (3) Decision rules for ordering priorities were/have been formulated relevant to other governmental and community agencies and groups.
- (4) Decision rules were/have been formulated appropriate to the severity of problems and the consequences of dealing or not dealing with them.
- (5) Decision rules were/have been formulated relevant to the assessed performance.
- (6) Decision rules were/have been formulated on the basis of what the Cooperative is not to deal with.

b. The clarity of the document on setting priorities was judged:

- (1) by the staff.
- (2) by the Board.

c. The extent of the involvement of Board members was judged:

- (1) by their questions.
- (2) by their general interest.

d. The relative ease with which consensus was reached on priorities, after study, was noted and analyzed.

6. Methodological choices for setting priorities were/have been resolved by adequate consideration of derivative benefits and projected costs.

- a. Syllogistic techniques for setting priorities were/have been considered.
- b. Deductive techniques for setting priorities were/have been reasonably considered.
- c. Inductive techniques for setting priorities were/have been reasonably considered.

- d. An advocacy approach for setting priorities was/has been considered.
- e. Various other techniques were/have been considered (e.g., sensitivity analysis, contingency analysis, afortiori analysis).

Standards

1. A mission statement for setting minimum standards was/has been
 - a. formulated.
 - b. submitted to the Board.
 - c. approved by the Board.
2. Expected outcomes for setting standards were/have been documented in verifiable performance objectives by dimensions of the problems.
 - a. A realistic statement of expected outcomes to attain were/have been documented.
 - b. A realistic statement of expected outcome on changes were/have been documented.
3. A written rationale for setting minimum standards was/has been approved by the Board.
 - a. Written performance objectives were/have been formulated on:
 - (1) specific targets.
 - (2) the relating of targets to problems.
 - (3) the justification for targets in terms of Cooperative capability (e.g., past, future).
 - (4) the communication of intention of the Cooperative (e.g., other agencies, public).
 - (5) establishing boundaries of functions.
 - (6) establishing boundaries for measuring organizational achievements.
 - (7) a basis for evaluating the effectiveness of the organization.
 - (8) point of orientation which facilitates the control and intelligent management of problem solutions.

- b. The rationale for setting minimum standards is adequate:
 - (1) justifies standards.
 - (2) validates standards.
 - (3) communicates intent.
 - (4) provides incentive/motivates.

- 4. Requisite conditions for setting standards were/have been delineated.
 - a. Limitations on setting standards were/have been delineated.
 - b. Constraints on setting standards were/have been delineated.
 - c. Available inputs to setting standards were/have been delineated.
 - d. Operational conditions on setting standards were/have been delineated.
 - e. Operational activities for setting standards were/have been delineated by:
 - (1) Cooperative functions.
 - (2) Cooperative relations (e.g., other agencies, groups, individuals).
 - (3) the implications of operational activities for expected output of setting standards were/have been analyzed.
 - f. Requisite conditions for setting standards were/have been established in terms of the dimensions of the problem(s).
 - g. Requisite inputs essential to setting standards were/have been delineated (e.g., human, financial, information, and material) by source (e.g., Cooperative, agencies, groups, and individuals).
 - h. Requisite conditions for setting standards with respect to the performance capability of the Cooperative were/have been analyzed (e.g., past, future).
 - (1) Functional limits relevant to performance were/have been analyzed.
 - (2) Relational limits relevant to performance were/have been analyzed.
 - (3) Constraints relevant to performance were/have been analyzed.

(a) Positive-negative directionality was analyzed.

(b) Relational forces and conditions were analyzed.

5. The delineation of standards for setting standards was/has been achieved.

a. Standards are clear.

b. Standards are practical.

c. Efficacy of standards as appropriate measures is affirmed.

d. Moral and resource support was/has been received.

e. Types of standards were/have been considered.

(1) achievement

(2) degree of change

(3) type of change

(4) rate of change

(5) direction of change

6. Performance objectives for setting minimum standards were/have been adequate.

a. Performance objectives for setting minimum standards were/have been valid based on:

(1) principles

(2) facts

(3) evidence

b. Performance objectives for setting minimum standards were/have been relevant to relators (e.g., germane, pertinent, and applicable).

c. Performance objectives were/have been feasible in terms of achievability judged by internal-external conditionality.

d. Performance objectives were/have been cognizant of key determinants of influence.

(1) legal

(2) economics

(3) technical

(4) political

(5) social

(6) situation

(7) action

e. Performance objectives were/have been acceptable to significant relators.

(1) validity

(2) relevant

(3) feasibility

(4) relative advantage

(5) adaptability

(6) diffusibility

(7) guideline usability

(8) requisites

f. Performance objectives for setting minimum standards were/have been consistent.

(1) External consistency was/has been attained (e.g., hierarchical -- policy, managerial, operational; political overlap, and communication).

(2) Internal consistency was/has been attained (e.g., with local school systems, standards with objectives and functions of the Cooperative, and support for attainment of objectives).

7. Requisite conditions were/have been assessed for achieving realistic expected outcome as measured by established standards.

a. Activities were/have been projected to solve problems.

(1) Cooperative activities were/have been established.

(2) Activities involving others were/have been established.

- (a) agencies
 - (b) groups
 - (c) individuals
- b. Inputs essential to solution were/have been identified.
- (1) Cooperative inputs
 - (2) Relators' inputs
 - (a) agencies
 - (b) groups
 - (c) individuals
- c. Operational conditions essential to problem solution were/have been established.
- (1) Cooperative conditions
 - (a) nature
 - (b) quality
 - (2) Relators conditions
 - (a) agencies
 - (b) groups
 - (c) individuals
- d. Expected outputs which must result from activities were/have been established.
- (1) Cooperative's expected outcomes
 - (2) Relators' expected outcomes

Alternatives

- 1. An adequate orientation to the problem was/has been achieved.
 - a. The treatment variety was/has been delineated.
 - b. Requisite conditions under which the Cooperative must function to generate alternatives were/have been delineated.

c. The specificity of the problem was/has been internalized.

d. A preparation period was/has been used:

(1) for asking questions,

(2) for hypothesizing,

(3) for data decisions.

(a) on pertinence,

(b) on accessibility,

(c) on analytical tractability.

2. Procedures have been followed for generating alternatives.

a. The mission statement for generating alternatives was/has been prepared.

b. The mission for generating alternatives statement was/has been recommended to the Board of Control.

c. The action of the Board of Control on the mission statement was/has been to:

(1) accept,

(2) reject,

(3) modify.

3. Expected outcomes of the generation of alternatives were/have been documented.

a. Alternatives solutions were generated for each problems.

b. Alternative solutions for any given problem addressed the dimensions of that problem.

c. The implications of actions within alternatives were/have been considered with respect to the relationship to the whole.

d. Models were/have been constructed for isolated cases.

4. A rationale for generating alternatives was/has been formulated.

a. Alternatives increased chances of solution.

b. The comparability of alternatives was/has been accentuated.

(1) Alternatives were/have been sensitive to:

- (a) delineation of elements,
- (b) delineation of relationships.

(2) Alternatives were/have been clearly formulated.

5. Requisite conditions for generating alternatives were/have been identified under field conditions.
6. Standards for the generating of alternatives were/have been formulated in terms of the effectiveness of the planner-analyst in accomplishing the expected outcome.
 - a. Alternatives were/have been presented clearly by the planner-analyst.
 - b. Alternative solutions were/have been related to the dimensions of the problem(s).
 - c. Appropriate analytical techniques were/have been ably applied.
7. Problem-solving participants were/have been selected in accordance with appropriate written decision rules.
 - a. Knowledge and wide experience with the target population was/has been called for by decision rule(s).
 - b. Direct association with the target population was/has been called for by decision rule(s).
 - c. Membership in the target population was/has been stipulated by decision rule(s).
 - d. Knowledgeability with respect to specific problems was/has been stipulated by decision rule(s).
 - e. Members of the Cooperative staff were/have been stipulated by decision rule(s).
 - f. Appropriate representation of agencies with legitimate responsibility relative to the problem was/has been called for by decision rule(s).
 - g. Appropriate representation of agencies with vested interest relative to the problem was/has been called for by decision rule(s).
 - h. Knowledge skills were/have been tapped by decision rule(s) (e.g., verbalizing divergent viewpoints, perceiving situations and conditions from varying perspectives, conceptual talent, emotional involvement).

- i. Capability for approaching the problem from a wider perspective than those immediately involved with the problem was/has been stipulated by decision rule(s) (e.g., outside specialists, agencies with higher level responsibilities, and agencies with encompassing goals).

8. Individuals and groups were/have been oriented to the task of generating alternatives.
 - a. Provision was/has been made for a cohesive effort.
 - (1) Misunderstanding and conflict were/have been guarded against.
 - (2) Ground rules were/have been formulated.
 - b. All available information was/has been applied.
 - c. Each problem was/has been viewed from different perspectives (e.g., personal experiences).
 - d. Each problem was/has been understood in terms of its own dimensions.
 - e. Various activities were/have been used to solve the problem (e.g.,
 - (1) message-by-target
 - (a) visit target
 - (b) interact with target
 - (c) experience target environment
 - (d) experience target conditions
 - (e) experience target deficiency
 - (2) message-by-implication
 - (a) witness
 - (b) future well-being of clients
 - (3) message-by-similarity
 - (4) message-by-Cooperative
 - (a) purpose

- (b) function
- (c) relation
- (d) transformation

9. Appropriate leadership behavior was/has been established.
 - a. Criticism or judgments of ideas was/has been ruled out.
 - b. Belittlement was/has been discouraged.
 - c. Free-wheeling was/has been welcomed and encouraged.
 - d. Quantity of contribution was/has been solicited and encouraged.
 - e. Combinations of ideas was/has been encouraged.
 - f. Operational solutions were/have been solicited and stressed.
10. The synectic process was/has been utilized in problem stating and solving.
 - a. Personal analogy was/has been used in problem formulation and solution.
 - b. Direct analogy was/has been used in problem formulation and solution.
 - c. Symbolic analogy was/has been used in problem formulation and solution.
 - d. Fantasy analogy was/has been used in problem formulation and solution.
11. Incubation and illumination were/have been utilized in generating ideas.
12. Solution ideas were/have been recorded as they were/have been established.
13. The preparation of alternative solutions was/has been the responsibility of the planner-analyst.
 - a. Multiple solutions to different dimensions of the problem were/have been:
 - (1) refined
 - (2) stated with specific reference to each dimensions
 - (3) combined in various ways

(4) described in terms of the relationships among solution elements.

b. Alternative solutions were/have been prepared with explicit delineation of:

(1) elements

(2) relationships

(3) strategy

14. Each alternative solution was/has been presented in the form of a model with components relating to the dimensions of the problem.

Appendix D

Educational Planning Bibliography

- Adams, Dan (ed.). Educational Planning. Syracuse: Syracuse University Press, 1964.
- Alameda County School Department PACE Center. Fault Tree Analysis, A Research Tool for Educational Planning, Technical Report No. 1. Hayward, California: Alameda County PACE Center, 1966. (ED 029 379)
- Almond, Gabriel A. and James S. Coleman (eds.). The Politics of the Developing Areas. Princeton: Princeton University Press, 1960.
- Alper, Paul. "A Critical Appraisal of the Application of Systems Analysis to Educational Planning," IEEE Transactions on Education, XI(2), June, 1968.
- _____. "Introduction of Control Concepts in Educational Planning Models," Mathematical Models in Educational Planning. Paris: Organization for Economic Cooperation and Development, 1967.
- _____. "Some Consistency Models in Educational Planning," Socio-Economic Planning Sciences, IV:201-206, June, 1970.
- American Association of School Administrators. ERIC Abstracts: A Collection of ERIC Document Resumes on Educational Planning. Washington, D.C.: American Association of School Administrators, 1971.
- Anderson, C. A. The Social Context of Educational Planning. Paris: United Nations Education, Scientific, and Cultural Organization, IIEP, 1967.
- Andes, John. "Alternative Models for Urban School District Organization," Educational Administration Quarterly, VII:64-86, Winter, 1971.
- Anthony, Robert N. Planning and Control Systems: A Framework for Analysis. Boston: Harvard Business School, 1965.
- Appalachia Educational Laboratory. Descriptive Design for the Educational Cooperative. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1971.
- _____. Educational Cooperative: Basic Program Plan. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1972.
- Archibald, Russell D. and Richard L. Villoria. Network-Based Management Systems (PERT/CPM). New York: John Wiley and Sons, Inc., 1968.
- Armitage, Peter M., Cyril S. Smith, and Paul Alper. Decision Models for Educational Planning. London: Penguin, 1969.
- Beeby, C. E. (ed.). Qualitative Aspects of Educational Planning. Paris: United Nations Education, Scientific, and Cultural Organization, 1969.
- Beeley, Clarence Edward. Planning and the Education Administrator: Fundamentals of Educational Planning. Paris: United Nations Education, Scientific, and Cultural Organization, International Institute of Educational Planning, 1967.

- Bell, Thomas O., Rex W. Hagans, Ronald R. Harper, and John E. Seger. A System of Comprehensive Educational Planning and Evaluation. Portland, Oregon: Northwest Regional Educational Laboratory, 1971.
- Bennis, Warren G. "Theory and Method in Applying Behavioral Science to Planned Organizational Change," Journal of Applied Behavioral Science, 1:337-360, 1964.
- _____, Kenneth D. Benne, and Robert Chin. The Planning of Change. New York: Holt, Rinehart and Winston, Inc., 1969.
- Bereday, George Z. F. and Joseph A. Lauwery (eds.). Educational Planning: The World Year Book of Education. London: Evans Brothers, 1967.
- Berkman, Herman J. Planning Theory. Monticello, Illinois: Council of Planning Librarians, 1967.
- Blaug, Mark. Alternative Approaches to Educational Planning, Economic Journal. June, 1967.
- Bowles, Samuel. Planning Educational Systems for Economic Growth. Cambridge: Harvard University Press, 1969.
- _____. "Toward Equality of Educational Opportunity," Harvard Educational Review, Winter, 1968.
- Caldwell, Michael S. "Input Evaluation and Educational Planning." Columbus, Ohio: Evaluation Center, Ohio State University, January, 1968. (ED 075 043)
- California State Department of Education. Conceptual Design for a Planning, Programming, Budgeting System for California School Districts, Preliminary. Sacramento: California State Department of Education, 1969. (ED 036 124)
- Campbell, Vincent N. and David G. Markle. Identifying and Formulating Educational Problems. Final Report, USOE Research Contract #OEC4706-2931-3064. Berkeley, California: Far West Laboratory for Educational Research and Development.
- Carrese, Louis M. and Carl G. Baker. "The Convergence Technique: A Method for the Planning and Programming of Research Efforts," Management Science, XIII:B-420-B-438, April, 1967.
- Cartwright, Desmond S. and N. A. Reuterman. "Ecological Analysis of the State of Colorado." Paper read at the annual meeting of the Society of Multivariate Experimental Psychology. Berkeley, California, November, 1967.
- Casasco, Juan A. Corporate Planning Models for University Management. Washington, D.C.: ERIC Clearinghouse on Higher Education, 1970. (ED 042 933)

Calanese, James. Systematic Planning: An Annotated Bibliography and Literature Guide. Monticello, Illinois: Council of Planning Librarians, 1969.

Center for Effecting Educational Change. A Comprehensive Model for Managing an ESEA Title III Project from Conception to Culmination. Fairfax, Virginia: Center for Effecting Educational Change, 1968. (ED 025 859)

Chase, William W. "The Educational Facilities Charrette," Educational Technology, X:20-21, June, 1970.

Chau, Ta Ngoc. Demographic Aspects of Educational Planning. Paris: United Nations Education, Scientific and Cultural Organization, 1969.

Chesswas, J. D. Methodologies of Educational Planning for Developing Countries II. Paris: United Nations Education, Scientific and Cultural Organization, 1969.

Christie, Samuel G. and Jay D. Scribner. "A Social System Analysis of Innovation in Sixteen School Districts." Paper presented at the annual meeting of the American Educational Research Association, Los Angeles, February, 1969. (ED 029 369)

Churchman, C. West, Russell L. Ackoff, and E. Leonard Arnoff. "Weighting Objectives," Introduction to Operations Research. New York: John Wiley and Sons, Inc., 1957.

Clark, Kenneth B. "Alternative Public School Systems," Harvard Educational Review, Winter, 1968.

Clark, Peter A. and Janet R. Ford. "Methodological and Theoretical Problems in the Investigation of Planned Organizational Change," Sociological Review, XVIII:29-52, March, 1970.

Combs, P. H. What Is Educational Planning. Paris: United Nations Education, Scientific and Cultural Organization, 1963.

Conant, James Bryant. Shaping Educational Policy. New York: McGraw-Hill Book Company, 1964.

Cook, Desmond L. "Applications of PERT to Education." Paper presented at the PERT Workshop, Ohio State University, Columbus, Ohio, October, 1964.

_____. "Better Project Planning and Control Through the Use of Systems Analysis and Management Techniques." Paper presented at the Symposium on Operations Analysis of Education, Washington, D.C., November, 1967. (ED 019 729)

_____. A Needed Reorientation of Educational Research for Educational Planning. Columbus: Ohio State University, 1968. (ED 025 014)

Cook, Desmond L. "PERT Applications in Educational Planning." Columbus, Ohio: Ohio State University, May, 1966. (ED 019 751)

_____. "Program Evaluation and Review Technique: Applications in Education." Cooperative Monograph No. 17. Washington, D.C.: United States Government Printing Office, 1966.

_____. "Some Economic Considerations in Educational Project Planning." Columbus, Ohio: Ohio State University, July, 1968.

_____. "The Use of Systems Analysis and Management Techniques in Program Planning and Evaluation." Columbus, Ohio: Ohio State University, June, 1967. (ED 019 752)

Copa, George H. "Identifying Educational System Inputs Toward Production Function Application in Education." Paper presented at the annual meeting of the American Educational Research Association, New York, February, 1971.

Correa, Hector. Educational Planning: Its Quantitative Aspects and Integration with Economic Planning. Paris: International Institute for Educational Planning, 1965.

_____. "Models and Mathematics in Educational Planning," Educational Planning: The World Book of Education. London: Evans Brothers, 1967.

_____. Quantitative Methods of Educational Planning. Scranton: International Textbook Company, 1969.

Curle, Adam. The Professional Identity of the Educational Planner. Paris: United Nations Educational, Scientific and Cultural Organization, 1969.

Daniere, A. Educational Planning, A Critical Review and Recommendations for AID. Washington, D.C.: Agency for International Development, 1969. (ED 033 460)

Davis, Russel C. Planning Human Resources Development Educational Models and Schemata. Chicago: Rand McNally, 1966.

Della-Dora, Delmo. Planning New Development Efforts, Recommended Procedures. Detroit: Michigan-Ohio Regional Educational Laboratory, Inc., 1969. (ED 035 992)

Doherty, Victor. Goals and Objectives in PPBS. Portland, Oregon: Portland Public Schools, 1970. (ED 044 815)

Dror, Yehzekel. "Systems Analysis and National Modernization Decisions," Academy of Management Journal, XIII:139-152, June, 1970.

_____. "Systems Analysis for Development Decisions: Applicability, Feasibility, Effectiveness and Efficiency." Santa Monica, California: The Rand Corporation, August, 1969.

- Eastmond, Jefferson N. The Process of Educational Planning, PROJECT DESIGN, Interagency Planning for Urban Educational Needs, No. 31. Fresno, California: Fresno City Unified School District, August 16, 1968. (ED 038 769)
- Edding, Friederich and Jens Naumann. A Systems Look at Educational Planning, Education and Economic Growth. Proceedings of the First Annual Conference on the Economics of Education, Richard H. P. Kraft (editor). Tallahassee, Florida: Educational Systems Development Center, 1968.
- Eidell, Terry L. and John M. Nagle. PPBS and Data-Based Educational Planning. Eugene, Oregon: Oregon University, 1970. (ED 038 741)
- Elam, Stanley and Gordon I. Swanson (eds.). Educational Planning in the United States. Itasca, Illinois: F. E. Peacock Publishers, Inc., 1969.
- ERIC/CLEM. Models for Planning: Analysis of Literature and Selected Bibliography. Eugene, Oregon: ERIC Clearinghouse on Educational Administration, 1970.
- Fantini, Mario D. "Intervention Alternatives for Urban Education," Harvard Educational Review, Winter, 1968.
- Ferrero di Roccaferrera, Giuseppe M. Sensitivity Analysis and the Managerial Decision Process. Department of Management Science, Syracuse University, 1970.
- Flanagan, John C. Defining Educational Outcomes for Today's Schools and Assessing Their Attainment. Iowa City: Iowa University, 1968. (ED 026 734)
- Fox, Karl A. and Jati K. Sengupta. "The Specification of Econometric Models for Planning Educational Systems: An Appraisal of Alternative Approaches," Kyklos, 21:665-693, 1968.
- Gaa, John P. Goal Setting: Review of the Literature and Implications for Future Research, Working Paper Number 47. Madison: Wisconsin University, 1970. (ED 050 413)
- Gephart, William J. Criteria for Methodological Adequacy for Research on Educational Change. Bethesda, Maryland: ERIC, 1965. (ED 011 146)
- Gibson, John E. "Adaptive and Learning Control Systems," System Engineering Handbook. New York: McGraw-Hill Book Company, 1965.
- Guba, Egon G. Methodological Strategies for Educational Change. Bethesda, Maryland: ERIC, 1965. (ED 011 404)
- Handy, H. W. and K. M. Hussain. Network Analysis for Education Management. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1969.
- Harbison, F. Educational Planning and Human Resource Development. Paris: United Nations Education, Scientific and Cultural Organization, 1967.

- Harbison, Frederick and Charels A. Myers. Education Manpower and Economic Growth: Strategies of Human Resource Development. New York: McGraw-Hill Book Company, Inc., 1964.
- Harvard Educational Review. "Equal Educational Opportunity." Cambridge, Massachusetts: Harvard University Press, 1969.
- Havelock, Ronald G. Planning for Innovation. Final Report, U.S.O.E. Research Contract #OEC 37-070028-2193. Ann Arbor, Michigan: University of Michigan, 1969. (ED 02- 171)
- . Planning for Innovation Through Dissemination and Utilization of Knowledge. Ann Arbor, Michigan: Center for Research on Utilization of Scientific Knowledge, Institute for Social Research, University of Michigan, 1970.
- Hock, Michael Dennis. Considerations of Decision Theory in the Reconstruction of Logic in Urban Planning. Columbus, Ohio: Ohio State University, 1968. (ED 034 299)
- International Bureau of Education, United Nations Education, Scientific and Cultural Organization. Education Planning. Paris: IBE, United Nations Education, Scientific and Cultural Organization, 1962.
- International Institute for Educational Planning. Educational Planning, A Bibliography. Paris: International Institute for Educational Planning, 1964. (ED 035 982)
- Iowa University. "The Intermediate Unit of School Administration in the United States, etc., The Multi-County Regional Educational Service Agency in Iowa. Iowa City, Iowa: Iowa University, 1967. (ED 026 700)
- . The Multi-County Regional Educational Service Agency in Iowa, (chapters XIII-XIX). Iowa City, Iowa: Iowa University, 1967. (ED 026 702)
- . The Multi-County Regional Educational Service Agency in Iowa, Appendix. Iowa City, Iowa: Iowa University, 1967. (ED 026 703)
- . "A Proposal for the Establishment of a Network of Multi-County Regional Educational Service Agencies in the State of Iowa, The Multi-County Regional Educational Service Agencies in the State of Iowa. Iowa City, Iowa: Iowa University, 1967. (ED 026 701)
- Jallade, Jean-Pierre. Educational Planning Methods. Background Study No. 8 Conference on Policies for Educational Growth. Paris: Organization for Economic Cooperation and Development, 1970. (ED 069 023)
- Johnson, Gleen Hays. "A Search for Functional Unities: An Analysis of United States County Data." Unpublished dissertation, Department of Sociology, New York University, 1958.
- Kaplan, Howard G. "An Empirical Typology for Urban Description." Unpublished dissertation, Department of Sociology, New York University, 1958.
- Kaufman, Roger A. Educational System Planning. Englewood Cliffs, New Hersey: Prentice-Hall, 1972.

- Keeney, M. G., H. E. Koenig, and R. Semach. State-Space Models of Educational Institutions. East Lansing, Michigan: Division of Engineering Research, Michigan State University, 1967.
- Kent, W. P., B. Davis, and W. A. LeBaron. A Preliminary System Description and Critique of the Appalachia Educational Cooperative. Falls Church, Virginia: System Development Corporation, 1967.
- Kraft, Richard H. P. Strategies of Educational Planning, Proceedings of the Annual Conference on the Economics of Education. Tallahassee: Florida State University, 1969. (ED 027 615)
- Levien, Roger E. et al. National Institute of Education: Preliminary Plan for the Proposed Institute. Santa Monica, California: RAND, 1971. (ED 047 167)
- Light, Richard J. and Paul V. Smith. "Choosing a Future: Strategies for Designing and Evaluating New Programs," Harvard Educational Review, XL:1-28, Winter, 1970.
- Link, A. D. A Planner's Reference Guide Relating to Socioeconomic Factors Within Appalachia/as Applied to Public Education. Las Cruces, New Mexico: New Mexico State University, 1970. (ED 045 279)
- Maguire, Louis M., Sanford Temkin, and C. Peter Cummings. An Annotated Bibliography on Administering for Change. Philadelphia, Pennsylvania: Research for Better Schools, 1971.
- Marien, Michael D. Alternative Futures for Learning: An Annotated Bibliography of Trends, Forecasts, and Proposals. Syracuse: Syracuse University Corporation, 1971. (ED 051 571)
- Mason, R. Hal. "Developing a Planning Organization," Business Horizons, XII:61-69, August, 1969.
- Miles, Matthew, B. "Planned Change and Organizational Health: Figure and Ground," Richard O. Carlson (editor), Change Process in the Public Schools. Eugene, Oregon: Center for the Advanced Study of Educational Administration, 1964.
- Miller, Donald R. A System Approach to Planned Change in Education, Volume II: A Strategy for Planned Change in Education. Burlingame, California: OPERATION PEP, 1970. (ED 046 120)
- . Planning, Developing and Implementing Title III ESEA Projects. Burlingame, California: OPERATION PEP, 1968. (ED 022 247)
- Modes, Joseph J. and Cecil R. Phillips. Project Management with CRM and PERT, Second Edition. New York: Van Nostrand Reinhold Company, 1970.
- Mushkin, Selma J. and James R. Cleaveland. Planning for Educational Development in a Planning, Programming, Budgeting System. Washington, D. C.: National Educational Association, 1968. (ED 024 154)
- North Carolina State Board of Education. A Digest of Educational Planning. Raleigh: North Carolina State Board of Education, 1963. (ED 024 229)

Northwest Regional Educational Laboratory. Educational and Social Demands on the Schools, Analysis of Literature and Selected Bibliography, Analysis and Bibliography Series, No. 1. Eugene, Oregon: Oregon University, 1970. (ED 043 110)

. Improving Small Schools: Basic Program Plans. Portland, Oregon: NWREL, 1970.

. Models for Planning, Analysis of Literature and Selected Bibliography, Analysis and Bibliography Series, No. 5. Eugene, Oregon: Oregon University, 1970. (ED 043 114)

Organization for Economic Cooperation and Development. Manpower Forecasting in Educational Planning. Paris: Organization for Economic Cooperation and Development, 1967.

. Mathematical Models in Educational Planning, Education and Development. Paris: Organization for Economic Cooperation and Development, 1967.

. Methods and Statistical Needs for Educational Planning. Paris: Organization for Economic Cooperation and Development, 1967.

. Social Objectives in Educational Planning. Paris: Organization for Economic Cooperation and Development, 1957.

OPERATION PEP. Symposium on the Application of System Analysis and Management Techniques to Educational Planning in California. Burlingame, California: OPERATION PEP, June, 1967.

Ott, Jack M. A Decision Process and Classification System for Use by Title I Project Directors in Planning Educational Change. Bethesda, Maryland: ERIC. (ED 034 298)

Parnes, Herbert. Forecasting Educational Needs for Economic and Social Development. Paris: Organization for Economic Cooperation and Development, the Mediterranean Regional Project, 1962.

Peterson, Richard F. The Crisis of Purpose, Definition and Uses of Institutional Goals. Washington, D.C.: ERIC Clearinghouse on Higher Education, 1970. (ED 042 934)

Piele, Philip K. and Terry L. Eidell (Eds.). Social and Technological Change: Implications for Education. Eugene, Oregon: University of Oregon Press, 1970.

Platt, William J. Research for Educational Planning. Paris: United Nations Education, Scientific and Cultural Organization, 1970.

Poignant, R. The Relation of Educational Plans to Economic and Social Planning. Paris: United Nations Education, Scientific and Cultural Organization, IIEP, 1967.

PROJECT DESIGN. Mission Objectives, PROJECT DESIGN. Fresno, California: Fresno City Unified School District, 1969. (ED 038 770)

Summary, PROJECT DESIGN, Educational Master Plan. Fresno, California: Fresno City Unified School District, 1969. (ED 038 775)

Quade, E. S. "Self-Defeating to Accept Without Inquiry the Policy-Makers' View of What the Problem Is," Analysis for Military Decisions. Chicago: Rand McNally, 1964.

Rosvoe, P. E. A Provisional Survey and Evaluation of the Current Forecasting State of the Art for Possible Contributions to Long-Range Educational Policy Making. Santa Monica, California: System Development Corporation, 1967.

Rudwick, Bernard H. Systems Analysis for Effective Planning: Principles and Cases. New York: John Wiley and Sons, Inc., 1966.

Ruliffson, W. A. An Analysis of the Rationale and Procedures for Long-Range Planning--Found in Selected Enterprises, Government Agencies or Department and School Systems--Which are Appropriate for Education and Administration Planning in Local School Systems. New York: Columbia University, 1968. (ED 020 571)

Ruscoe, G. C. The Conditions for Success in Educational Planning. Paris: United Nations Education, Scientific and Cultural Organization, 1969.

Savard, William G. A Dynamic General Planning Model for the Hawaii Department of Education. Honolulu: Hawaii State Department of Education, 1967. (ED 020 560)

Shaycoft, Marion F. A New Multivariate Index for Use in Educational Planning. Palo Alto, California: American Institute for Research, 1969. (ED 035 026)

Sisson, Roger L. and C. Edwin Brewin. An Introduction to the Education-Planning-Programming-Budgeting System. Philadelphia: Government Studies Center of the Fels Institute, University of Pennsylvania, November, 1969.

Sisson, Roger L., C. Edwin Brewin, Jr., and Benjamin H. Renshaw. "An Introduction to the Educational-Planning-Programming-Budgeting System," Educational Technology, XII(2):54-59, February, 1972.

Sisson, Roger L. et al. "The Project Concept in Planning, Programming and Budgeting," Socio-Economic Planning Sciences, IV:239-261, June, 1970.

Smith, Gary R. Workshop on Planning, Implementing and Evaluating Balanced Programs in Distributive Education. Logan, Utah: Utah State University, 1969. (ED 035 106)

South Carolina State Department of Education. Planning Design for Basic Educational Data Systems. Columbia, South Carolina: South Carolina State Department of Education, 1969. (ED 034 296)

Starr, Martin Kenneth. Product Design and Decision Theory. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1963.

Steering Committee, Appalachia Regional Educational Laboratory. Quality Education for Appalachia: A Prospectus Proposing the Establishment of a Regional Laboratory. Charleston, West Virginia: Steering Committee, 1965.

Stepp, Ermel. Planning Educational Systems Control: A State-Space Model of Strategic Factors. Ann Arbor, Michigan: University Microfilms, 1971.

_____ et al. Educational Planning: An Evaluation Instrument. Charleston, West Virginia: Appalachia Educational Laboratory, 1972.

_____. General Evaluation Design for the Educational Development Program. Charleston, West Virginia: Appalachia Educational Laboratory, 1972.

_____. Special Evaluation Submodel for Educational Planning. Charleston, West Virginia: Appalachia Educational Laboratory, forthcoming, 1972.

Taylor, Donald W. "Decision Making and Problem Solving," Handbook of Organizations. Chicago, Illinois: Rand McNally and Company, 1965.

Temkin, Sanford. "Comprehensive Planning for School Districts." Paper presented at the annual meeting of the American Educational Research Association, Minneapolis, March, 1970. (ED 041 389)

_____. An Evaluation of Comprehensive Planning Literature with an Annotated Bibliography. Philadelphia: Research for Better Schools, Inc., 1970. (ED 048 332)

Tracz, George S. An Overview of Optimal Control Theory Applied to Educational Planning. Bethesda, Maryland: ERIC. (ED 030 189)

Trenton Public Schools. Building a Comprehensive Planning System Model with EPPBS. Trenton, New Jersey: Trenton Public Schools, 1971. (ED 057 457)

Tye, Kenneth A. "Unfreezing the System: Equilibrium and Organizational Health." Santa Anna, California: Orange County Schools Office Supplementary Educational Center, November, 1968.

United Nations Education, Scientific and Cultural Organization. Economic and Social Aspects of Educational Planning. Paris: United Nations Education, Scientific and Cultural Organization, 1964.

Vaizey, J. and J. D. Chesswas. The Costing of Educational Plans. Paris: United Nations Education, Scientific and Cultural Organization, IIEP, 1967.

- Vivekanthan, P. S. Development of a Planning System for Educational Research and Development Centers. Raleigh: North Carolina State University, 1971. (ED 061 432)
- Von Allmen, Erwin. "Setting Up Corporate Planning," Long-Range Planning, II:2-8, September, 1969.
- Vroon, John. Rating Priorities, Setting Standards, and Generating Alternatives. Charleston, West Virginia: Appalachia Educational Laboratory, 1972.
- Weathersby, George B. Educational Planning and Decision Making: The Use of Decision and Control Analysis. Los Angeles: Office of the Vice President -- Planning and Analysis, University of California, 1970.
- Webster, Maureen et al. Educational Planning and Policy, an International Bibliography, Working Draft, Parts I-VI. Syracuse: Syracuse University, Research Corporation, 1969. (ED 042 238)
- Western New York School Study Council. Development of an Operational Model for the Application of Planning--Programming--Budgeting Systems in Local School Districts. Buffalo, New York: Western New York School Study Council, 1969. (ED 033 447)
- Wiley, Russell W. "Blocks to Change," Educational Leadership, XVII:351-353, January, 1970.
- Williams, Gareth L. Towards a National Educational Planning Model. Paris: Organization for Economic Cooperation and Development, 1967. (ED 021 311)
- Winn, Ira J. "Educational Planning and the System, Myth and Reality," Comparative Education Review, XIII:343-350, October, 1969.

Appendix E

Educational Reallocation Bibliography

- Howles, Samuel. "A Planning Model for Efficient Allocation of Resources in Education." Unpublished Doctoral dissertation, Department of Economics, Harvard University, Cambridge, 1965.
- Correa, Hector. The Economics of Human Resources. Amsterdam: North-Holland Publishing Company, 1963.
- Curtis, Dr. William H. Educational Resources Management System. Chicago: Research Corporation, 1971.
- Eidell, Terry L. and Philip Piele. A Bibliography of Selected Documents on Planning Programming Budgeting Systems. Eugene, Oregon: Oregon University, 1968. (ED 018 876)
- Fox, Thomas G. "A Study of Educational Resource Transformation Within a Large City Public High School System." Unpublished dissertation, Department of Economics, Syracuse University, 1966.
- Gustafson, Richard A. Multiple Regression Prediction Models in the Behavioral Sciences: Prediction of Federal Aid Allocations to Local School Districts. Bethesda, Maryland: ERIC, 1971. (ED 048 353)
- Prediction of Federal Aid Allocations to Local School Districts in Connecticut. Bethesda, Maryland: ERIC, 1971. (ED 047 389)
- Hagen, John. Program Budgeting. Los Angeles: California University, 1968. (ED 038 742)
- Haggart, Sue A. (ed.). Program Budgeting for School District Planning. Englewood Cliffs, New Jersey: Educational Technology Publications, 1972.
- Harman, W. G. Three Approaches to Educational Resource Allocation. Ontario: Toronto University, 1968. (ED 040 491)
- Hoffenberg, Marvin and Marvin Alkin. Application of Leontief Input-Output Analysis to School District Budgeting. Los Angeles: California University, 1970. (ED 043 940)
- Holland, John W. "An Analysis of Internal and External Determinants of the Outcome of Urban Schools." Unpublished dissertation, School of Education, Syracuse University, Syracuse, 1966.
- Holtman, A. G. "Linear Programming and the Value of an Input to a Local Public School System," Public Finance, 23:429-440, 1968.
- Huff, Robert A. Program Budgeting at Micro-U., A Wiche Management Information Systems Training Document. Boulder, Colorado: Western Interstate Commission for Higher Education, 1970. (ED 052 751)
- Judy, Richard W. A Research Progress Report on Systems Analysis for Efficient Resource Allocation in Higher Education. Ontario: Toronto University, 1970. (ED 039 828)

Koenig, Herman E. A Systems Model for Management, Planning and Resource Allocation in Institutions of Higher Education. Final Report. East Lansing: Division of Engineering Research, Michigan State University, 1968.

_____ and Martin G. Keeney. A Prototype Planning and Resource Allocation Program. East Lansing, Michigan: Systems Science Program, College of Engineering, Michigan State University, 1967.

_____ "A Prototype Planning and Resource Allocation Program for Higher Education." Paper presented at the Symposium on Operations Analysis of Education, National Center for Educational Statistics, U.S. Office of Education, Washington, D.C., November, 1967.

Miller, Donald M. et al. Multivariate Procedures for Stratifying School Districts. Madison, Wisconsin: State Department of Public Instruction, OSOE Project No. 5-8043-2-12-1, March, 1967.

Nuttall, Ronald L. and Richard J. Doyle. Toward a Model of School Operations: Relating Budgetary and Personnel Inputs to Indices of School Functioning, Working Paper. Bethesda, Maryland: ERIC, 1970.
(ED 048 630)

Piele, Philip K. and David G. Bunting. Program Budgeting and the School Administration, A Review of Dissertations and Annotated Bibliography, Review Series, Number Two. Eugene, Oregon: Oregon University, 1969.
(ED 035 065)

Porter, David O. Organizational Aspects of Resource Mobilization. Burlingame, California: OPERATION PEP, 1970. (ED 050 477)

Reiss, William. Organizational Complexity: The Relationship Between the Administration Component and School System Size. Eugene, Oregon: Center for the Advanced Study of Educational Administration, 1970.

Rossmiller, Richard A., James A. Hale and Lloyd E. Kronhreich. Fiscal Capacity and Educational Finance Variations Among State, School Districts and Municipalities. Madison, Wisconsin: The University of Wisconsin, September, 1971.

Sardy, Susan and Hyman Sardy. Administrative Decision Making and Resource Allocation. Bethesda, Maryland: ERIC, 1971. (ED 048 629)

Stankard, Martin F., Jr. and Roger L. Sisson. On the Modeling of Relationships Between Performance and Resource Management in an Urban School District. Philadelphia: Pennsylvania University, 1968. (ED 025 839)

Thomas, Alan J. "Efficiency in Education, A Study of the Relationships Between Selected Inputs and Mean Test Scores in a Sample of Senior High Schools." Unpublished dissertation, Sanford University, 1962.

Thomas, J. Alan. An Economic Approach to Systems Analysis. Bethesda, Maryland: ERIC. (ED 029 380)

BEST COPY AVAILABLE

- Tracz, George S. A Quantitative Approach to the Design of School Bus Routes. Bethesda, Maryland: ERIC, 1970. (ED 039 641)
- Warner, David C. A Brief History and Analysis of Budgeting as a Tool of Allocation. Burlingame, California: OPERATION PEP, 1970.
- Zemach, Rita. A Model of Health Service Utilization and Resource Allocations. East Lansing, Michigan: Regional Medical Programs, Michigan State University, 1969.
- . A State Space Model for Resource Allocation in Higher Education. East Lansing, Michigan: Division of Engineering Research, Michigan State University, 1967.
- . A Systems Model for Management Planning and Resource Allocation in Institutions of Higher Education. National Science Foundation, Washington, D.C., 1968.

Appendix F

Educational Cost-Effectiveness Bibliography

- ABT Associates, Inc. System Analysis, Program Development, and Cost-Effectiveness Modeling of Indian Education for the Bureau of Indian Affairs, etc. Bethesda, Maryland: ERIC, 1969. (ED 032 992)
- System Analysis, Program Development, and Cost-Effectiveness Modeling of Indian Education for the Bureau of Indian Affairs, etc. Cambridge, Massachusetts: ERIC, 1969. (ED 032 993)
- System Analysis, Program Development, and Cost-Effectiveness Modeling of Indian Education for the Bureau of Indian Affairs, etc. Bethesda, Maryland: ERIC, 1969. (ED 032 994)
- Abt, Clark C. Design for an Elementary and Secondary Education Cost-Effectiveness Model, Volume I, Model Description, Volume II, The User's Guide. Cambridge, Massachusetts: ERIC 1967. (ED 014 152)
- Alkin, Marvin. Evaluating the Cost-Effectiveness of Instructional Programs. Los Angeles: California University. ERIC 1969. (ED 031 818)
- Averch, Harvey A. et al. How Effective is Schooling? A Critical Review and Synthesis of Research Findings. Santa Monica, California: The Rand Corporation, ERIC 1971. (ED 058 495)
- Badran, Yehia. A Cost Effectiveness Model for Educational Programs. Princeton, New Jersey: Educational Testing Service, 1970. (ED 054 523)
- Bressler, Marvin and Melvin M. Tumin. Evaluation of the Effectiveness of Educational Systems, Final Report, Volume I. Princeton, New Jersey: Princeton University, 1969. (ED 033 469)
- Evaluation of the Effectiveness of Educational Systems, Final Report, Volume I. Princeton, New Jersey: Princeton University, 1969. (ED 033 469)
- Browder, Jr., Lesley H. Emerging Patterns of Administrative Accountability. Berkeley, California: McCutchan Publishing Corporation, 1971.
- Cain, Glen G. Benefit Cost Estimates for Job Corps, Discussion Papers. Madison: Wisconsin University, 1967. (ED 037 495)
- Clark, C. Design for an Education System Cost-Effectiveness Model. Bethesda, Maryland: ERIC, 1967. (ED 025 044)
- Coleman, James S. et al. Equality of Education Opportunity. Washington: Government Printing Office, 1966.
- Cresap, McCormic and Paget, Inc. Economics in Education. New York: Cresap, 1971. (ED 058 500)

BEST COPY AVAILABLE

- Crum, Norman J. Cost-Benefit and Cost-Effectiveness Analysis: A Bibliography of Applications in the Civilian Economy. Santa Barbara, California: General Electric Company, 1969. (ED 047 715)
- Edding, Friedrich and Dieter Berstecher. International Developments of Educational Expenditure. Paris: United Nations Education, Scientific and Cultural Organization, 1969.
- Finch, James N. Testing the Cost Yardstick in Cost-Quality Studies. New York: Columbia University, 1967. (ED 023 151)
- Goldman, Thomas A. (Ed.) Cost-Effectiveness Analysis, New Approaches in Decision-Making. New York: Frederick A. Praeger, Publishers, 1971.
- Guthrie, James W. et al. A Survey of School Effectiveness Studies. Bethesda, Maryland: ERIC, 1970. (ED 037 397)
- Hallak, J. The Analysis of Educational Costs and Expenditure. Paris: United Nations Education, Scientific and Cultural Organization, 1969.
- Heuston, M. C. and G. Ogawa. "Observations on the Theoretical Basis of Cost-Effectiveness," Journal of the Operations Research Society of America, XIV:242-266, March-April, 1966.
- Hickey, Michael E. Optimum School District Size. The ERIC Clearinghouse on Educational Administration, University of Oregon, 1969.
- Hirsh, Werner. "Determinants of Public Education Expenditures," National Tax Journal, 13:29-40, 1960.
- Johns, R. L. The Relationship of Socioeconomic Factors, Educational Leadership Patterns and Elements of Community Power Structure to Local School Fiscal Policy. Bethesda, Maryland: ERIC, 1968. (ED 021 336)
- King, Donald W. and Nancy W. Caldwell. Cost-Effectiveness of Retrospective Search Systems. Washington, D. C.: American Psychological Association, 1971. (ED 051 837)
- Lessinger, Leon M. and Ralph W. Tyler (Editors). Accountability in Education. Belmont, California: Wadsworth Publishing Company, Inc., 1971.
- Levin, Henry M. A New Model of School Effectiveness. Stanford, California: Stanford Center for Research and Development in Teaching, School of Education, Stanford University, May, 1970.
- Lyden, Fremont J. and Ernest G. Miller. Planning, Programming, Budgeting: A Systems Approach to Management. Chicago: Markham Publishing Co., 1970.

BEST COPY AVAILABLE

- Mood, Alax M. and Frederick D. Weinfeld. Educational Factors Analysis and the Educational Opportunities Survey. Washington, D.C.: National Center for Educational Statistics, 1967.
- National Center for Educational Statistics. Supplemental Appendix to the Survey on Equality of Education Opportunity. Washington, D. C.: Government Printing Office, 1966.
- Nichols, Robert C. Where the Brains Are. Evanston, Illinois: National Merit Scholarship Corporation, 1966.
- O'Brien, Richard J. Cost Model for Large Urban Schools. Washington, D. C.: National Center for Educational Statistics, April 1967. (ED 013 527)
- Payzant, Thomas. Approaches to the Analysis of School Costs, An Introduction. Cambridge, Massachusetts: New England School Development Council, 1967. (ED 025 832)
- Reiss, William. Organizational Complexity: The Relationship Between the Size of the Administrative Component and School System Size. Eugene: Center for the Advanced Study of Educational Administration, 1970. (ED 043 974)
- Research for Better Schools. An Annotated Bibliography of Benefits and Costs in the Public Sector. Philadelphia: Research for Better Schools, Inc. 1968. (ED 026 744)
- Sabulão, Cesar and G. Alan Hickrod. Optimum Size of School Districts Relative to Selected Costs. Paper and symposia abstracts for the 1971 Annual Meeting. Washington: AERA, 1971.
- Seiler, Karl III. Introduction to Systems Cost-Effectiveness. New York: Wiley-Interscience, 1969.
- Spiegelman, Robert G. et al. Cost-Benefit Model to Evaluate Educational Programs, Progress Report. Menlo Park, California: Stanford Research Institute, 1967. (ED 012 828)
- Temkin, Sanford. A Comprehensive Theory of Cost-Effectiveness. Philadelphia: Research for Better Schools, Inc., 1970. (ED 040 503)
- . Cost-Effectiveness Evaluation as an Input into the Budgetary Process. Philadelphia: Research for Better Schools, Inc., 1969.
- . The Elasticity of Cost-Effectiveness: Implications for Public Sector Decision-Making. Bethesda, Maryland: ERIC, 1971. (ED 047 391)

- Vaizey, J. and J. D. Chesswas. The Costing of Educational Plans. Paris: United Nations Education, Scientific and Cultural Organization, 1967.
- Van Gijck, John P. and Richard E. Hill. Using System Analysis to Implement Cost-Effectiveness and Program Budgeting in Education. Englewood Cliffs, New Jersey: Educational Technology Publications, Inc., 1971.
- Weisbrod, Barton A. Spillover of Public Education Costs and Benefits, Part 1 -- Benefits. St. Louis, Missouri: Washington University, 1963.
- Wolty, Gordon A. Educational Benefit-Cost Analysis and the Problem of Scale. Bethesda, Maryland: ERIC, 1971. (ED 047 387)
- Wood, W. D. and H. F. Campbell. Cost-Benefit Analysis and the Economics of Investment in Human Resources, an Annotated Bibliography. Kingston, Ontario: Queen's University, 1970. (ED 045 848)
- Woodhall, Maureen. Cost-Benefit Analysis in Educational Planning. Paris: United Nations Education, Scientific and Cultural Organization, 1970.
- Zima, George C. "A New View of the Relation Between Cost and Quality in Education," IAR Research Bulletin, X:1-3; February, 1970.

Appendix G

Educational Programming in the Educational
Cooperative: An Evaluation Instrument

Educational Programming

1. The program designer was/has been capable relative to:
 - a. general understanding of the systems approach
 - b. understanding of the Educational Cooperative concept and process
 - c. knowledge of Cooperative districts
 - d. knowledge of controls of school activities
 - (1) statutory laws
 - (2) regulations
 - e. knowledge of successful curriculum strategies
 - f. knowledge of newly advocated curriculum strategies
 - g. leadership
 - (1) management techniques
 - (2) personnel administration
 - (3) change techniques
 - (4) group dynamics
 - (5) understanding educational psychology
 - (6) evaluative techniques
2. Expected difficulties were/have been identified.
 - a. financial limitations
 - b. attitudes of the people
 - c. policies and laws of the respective States
 - d. physical limitations
 - e. human resources limitations

CHOICE OF BEST ALTERNATIVE

3. A cost-benefit analysis was/has been done by the program-designer on alternative programs for each actionable need.
 - a. A detailed analysis of the problem was/has been completed and/or understood.
 - b. A complete list of alternatives was/has been prepared.
 - c. Any and all alternatives which fail to attack the problem were/have been eliminated.
 - d. A detailed analysis of the minimal acceptable standards for problem solution was/has been completed.
 - e. Any and all alternatives which would not provide minimum acceptable standards were/have been eliminated.
 - f. A detailed analysis of all available resources was/has been completed.
 - g. All alternatives which obviously would require more resources than are available were/have been eliminated.
 - h. The exact costs of those alternatives remaining on the basis of the availability of resources were/have been determined.
 - i. All resourceable alternatives were/have been ranked with respect to the degree each would exceed the minimum acceptable standard set for problem solution.
 - j. An analysis of each alternative was/has been completed in terms of projected costs and expected outcomes.
 - k. The alternatives to become the basis for program development was/has been selected.

PROGRAM DESIGN

4. Prespecified purposes were/have been analyzed and/or refined by the program designer..
 - a. The level of initial specificity in planning was/has been comprehended by the program designer.
 - b. Detailed program performance objectives were/have been written to supplement the planning objectives.
 - c. Basic analytical questions were/have been asked.

- (1) What behavior is expected?
 - (2) How is performance to be observed?
 - (3) Have evoking stimuli been identified?
 - (4) Are resources available to provide stimuli?
 - (5) Are acceptable performance levels specified?
 - (6) Are the circumstances given for expected performance?
- d. Refinements in objectives were/have been made with consideration of:
- (1) given problems
 - (2) chosen alternative solution
 - (3) program recipients
 - (4) learning environment
 - (5) available resources
5. A repertoire of planning components was/has been generated.
- a. A brief review of objectives was/has been written.
 - b. A description of the target group was/has been written.
 - c. A detailed list of exact design tasks was/has been written.
 - d. A personnel roster indicating design contributions was/has been prepared.
 - e. A calendar of design events was/has been prepared.
 - f. A budget for program design was/has been authorized.

INPUTS, ACTIVITIES, AND EVENTS

6. The availability, capability, and role expectations of mediators were/have been considered for the public, governing board, administrators, teachers, others.

Consideration	Availability	Capability	Role-Expectations
Domain			
Public	_____	_____	_____
Governing Board	_____	_____	_____
Administrators	_____	_____	_____
Teachers	_____	_____	_____
Others	_____	_____	_____

7. The availability of resources and requisite expertise relating to method were/have been considered for materials, content, media, and techniques.

Consideration	Availability	Requisite Expertise
Aspect		
Materials	_____	_____
Content	_____	_____
Media	_____	_____
Technique	_____	_____

8. A knowledgeability of context was/has been evidenced with respect to:

- a. world
- b. nation
- c. community
- d. school
- e. space
- f. time

9. The expected attainment of learners was/has been specified for each program.
10. The role-expectations of learners were/have been specified for each program (especially with respect to mediators).
11. A description of program requirements for facilities was/has been written (source, location, utilization).
12. A complete and detailed set of specifications for each program was/has been written.

PROGRAM IMPLEMENTATION

13. Mediators fulfilled role-expectations with respect to program character.
 - a. Mediators fulfilled role-expectations with respect to completely new programs.
 - b. Mediators fulfilled role-expectations with respect to programs supplementary to unchanged existing programs.
 - c. Mediators fulfilled role-expectations with respect to programs supplementary to changed existing programs.
 - d. Mediators fulfilled role-expectations with respect to replacement programs.
14. Resources were/have been available for implementation of methods.
 - a. Specified materials were/have been available (type and quantity).
 - b. Specified media were/have been available (equipment and supplies).
 - c. Specified operational facilities were/have been available.
 - d. Specified contact-time with learners was/has been available.
 - e. Specified program content was/has been treated.
 - f. Specified techniques were/have been used.
15. Power-authority relationships were/have been used to legitimize each program.
16. An awareness by learners of opportunities through each Cooperative program was/has been generated.
17. A desire by learners for benefits of programs was/has been created.

Appendix H

Educational Programming Bibliography

- Alkin, Marvin C. "The Use of Quantitative Methods as an Aid to Decision Making in Educational Administration." Paper presented at the Annual Meeting of the American Educational Research Association, Los Angeles, February, 1969.
- Appalachia Educational Laboratory. The Descriptive Design for the Educational Cooperative. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1972.
- Belanger, Laurence and Donald Kelly. The California PACE Narrative Reports of Projects to Advance Creativity in Education Conducted by Local Education Agencies in California, etc. Sacramento: California State Department of Education, 1969. (ED 034 283)
- Bogue, E. G. Strategies for Action: An Outline of Factors Which Influence Decisions on Program Plans. Memphis: Memphis State University, April, 1971. (ED 049 482)
- Cohn, Elchanan. Towards Rational Decision-Making in Secondary Education. University Park, Pennsylvania: Pennsylvania State University, 1970. (ED 044 812)
- Feyereisen, Katheryn V. A., John Fiorino, and Arlene T. Nowak. Supervision and Curriculum Renewal: A System Approach. New York: Appleton-Century Crofts, 1970.
- Flanagan, John C. "Administrative Behavior in Implementing Educational Innovations." Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, February, 1968. (ED 023 182)
- Green, Alan C. Environment for Learning, the 1970's. Madison: Wisconsin University, 1969. (ED 029 461)
- Hall, John S. Models for Rational Decision Making: Analysis of Literature and Selected Bibliography. Eugene, Oregon: ERIC Clearinghouse on Educational Administration, 1970.
- Harty, Harold. Perceptions of Consultant Utilization, Statistical Report, First Draft. Syracuse, New York: Eastern Regional Institute for Education, July 1970. (ED 051 556)
- Hough, Robbin R. A Study to Extend the Development and Testing of a Systems Model of the Classroom, Final Report. Rochester: Michigan State University, March 1968. (ED 033 452)
- Hsia, Hower J. An Information Theory Approach to Communications and Learning. Madison: Wisconsin University, April 1969. (ED 048 755)
- Hurd, Paul Dehart. The Changing Philosophy of Secondary School Science. Stanford: Stanford University, 1970. (ED 045 398)
- Johnson, Stuart. Freezing the System: Specifying Outcomes. Santa Anna, California: Orange County Schools Office Supplementary Educational Center, March, 1969.

- Langenbach, Michael. An Empirical Analysis of Curriculum Design. Bethesda, Maryland: ERIC. (ED 045 582)
- Martino, R. L. Allocating and Scheduling Resources -- Project Management and Control, Volume III. New York: Comet Press, Inc., 1965.
- Merrill, Paul F. Task Analysis: An Information Processing Approach. Tallahassee: Florida State University, 1971. (ED 050 554)
- O'Malley, J. Michael. Application of the Curriculum Hierarchy Evaluation (CHE) Model to Sequentially Arranged Tasks. Honolulu: Hawaii University, February, 1971. (ED 050 145)
- Pierce, Louise and Richard Mallory. Analysis of Achievement, PROJECT DESIGN, Interagency Planning for Urban Education Needs, No. 5. Fresno: Fresno City Unified School District, 1968. (ED 038 747)
- PROJECT DESIGN. Implementation, Planned Change, PROJECT DESIGN Education, Master Plan. Fresno, California: Fresno Unified School District, 1969.
- Skager, Rodney W. Evaluation and the Improvement of Compensatory Educational Programs. Los Angeles: California University, September 1969, ERIC. (ED 034 324)
- Stanger, Ross. "Corporate Decision Making: An Empirical Study," Journal of Applied Psychology, LIII:1-13, February, 1969.
- Stepp, Ermel. Planning Educational Systems Control. Ann Arbor: University Microfilms, 1971.
- Stepp, Ermel et al' Curriculum Programming: An Evaluation Instrument. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1972.
- . General Evaluation Design for the Educational Cooperative Program. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1972.
- . Special Evaluation Submodel for Curricular Programming. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., forthcoming, 1972.
- Strand, Shelby Elaine. So This is How You Run a Media Center: Organizing, Administering, and Developing a School-Instructional Media Center: An Annotated Bibliography. Grand Forks, North Dakota: North Dakota University, December, 1970. (ED 045 112)
- Verduin, John R., Jr. Conceptual Models in Teacher Education, An Approach to Teaching and Learning. Washington, D.C.: American Association of Colleges for Teacher Education, 1967. (ED 054 086)
- Wasserman, Paul and Fred S. Silander. Decision-Making: An Annotated Bibliography Supplement, 1958-1963. Ithaca, New York: Cornell University, 1964.

Whitney, H. and P. Piele. Annotated Bibliography on Year-Round School Programs. Eugene, Oregon: Oregon University, October 1968.
(ED 023 199)

Wilcox, Hayes. The Educational Process Part III - Draft. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1972.

Williamson, Stanley E. et al. Science, PROJECT DESIGN, Educational Needs, Fresno, 1968, No. 13. Fresno, California: Fresno City Unified School District, 1968. (ED 038 752)

Appendix I

Evaluation in the Educational Cooperative:
An Evaluation Instrument

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Antecedent Activities

1. The problem definition was understood before an evaluation design was developed.
 - a. The problem statement has been/was written and discussed in terms of evaluative implications.
 - b. The programmatic priorities have been/were written and discussed in terms of implications for evaluation.
 - c. The programmatic standards have been/were listed and their implications for evaluation discussed.
 - d. Programmatic alternatives have been/were identified and their implications for evaluation analyzed.
2. Solution design was understood before an evaluation design was developed.
 - a. Program specifications have been/were analyzed singly and jointly to ascertain implications for evaluation.
 - b. Programmatic implementation strategies have been/were analyzed to determine implications for evaluation.
 - c. Program component's compatibility has been/was analyzed to determine implications for evaluation.
 - d. Resource sufficiency for program has been/was analyzed to determine implications for evaluation.
 - e. The mutual compatibility of the problem definition and the solution design has been/was analyzed to determine implications for evaluation.
3. An evaluation design has been/was synthesized appropriate for the problem solution design.
 - a. A comprehensive flow chart of the evaluative process has been/was developed.
 - b. A delineation of data has been/was accomplished suitable for determining the degree of realization of programmatic specifications.
 - c. A procedure for gathering evaluative data has been/was devised.
 - d. A method of organizing evaluative data has been/was devised.
 - e. A scheme of analysis of evaluative data has been/was devised.

- f. A report has been/was planned to communicate evaluative findings to targeted users.
- g. A plan for the circulation of evaluative materials has been/was devised providing for distribution and collection.
- h. The compatibility of the evaluation design with the solution design has been/was analyzed.

Progress

- 4. An evaluative readiness has been/was realized.
 - a. A readiness to conduct information search has been/was realized.
 - b. A readiness to make decisions on discrepancy has been/was realized.
 - c. A readiness to make decisions on probable causes of discrepancy has been/was realized.
 - d. A readiness to generate alternative courses of action has been/was realized.
- 5. The syntal purpose of program components has been/was analyzed.
 - a. The syntal purpose of program components relative to contribution to the realization of objectives has been/was analyzed (in terms of actual instantaneous existence of components, the degree of realization of objective by relative payoff from each component).
 - b. The syntal purpose of program components relative to contribution to the realization of specifications has been/was analyzed.
- 6. The synergistic purpose of program component interactions has been/was analyzed.
 - a. The synergistic purpose of program component interactions relative to contribution to the realization of objectives has been/was analyzed.
 - b. The synergistic purpose of program component interactions relative to contribution to the realization of specifications has been/was analyzed.
- 7. A dynamic assessment of progress has been/was evident in provision for subjectivity and an attention to knowledge which facilitates decision making.

Search

8. Periodic information search has been/was conducted, in accordance with prescriptive design for gathering data.
 - a. Scheduled on-site interviews have been/were conducted where appropriate.
 - b. Scheduled telephone interviews have been/were made where appropriate.
 - c. Scheduled written reports have been/were made where appropriate.
9. Impromptu information search has been/was conducted, in accordance with prescriptive design for gathering data.
 - a. Impromptu written reactions to critical incidents have been/were brought into the data gathering function.
 - b. Impromptu telephone interviews have been/were made where appropriate.
 - c. Impromptu on-site visits have been/were made where appropriate.
10. Information search decision rules have been/were formulated in the evaluation design and applied for choosing to terminate, recycle, or advance.
 - a. Scientific criteria for the appraisal of information characterized the decision rules (e.g., validity, reliability).
 - b. Situational criteria have been/were incorporated into the decision rules (e.g., intuitive closure, pressing deadline).
11. Discrepancies have been/were determined on operational, criterion indices to judge the degree of realization of specifications and/or objectives.
 - a. Quantitative discrepancies have been/were made wherever appropriate.
 - b. Qualitative discrepancies have been/were appraised in consultation with program designers.
12. Decision rules on discrepancies have been/were formulated in the evaluation design and applied in choosing to terminate, recycle, or advance.
 - a. Scientific criteria have been/were reflected in the decision rules.

- b. Situational and/or subjective criteria have been/were allowed to modify a purely objective decision (e.g., qualitative judgment in consultation with program designers).

Cause

13. Probable causation has been/was analyzed (e.g., using a faulting technique) in accordance with the provisions for the identification of cause given in the evaluation design.
- Causal elements and relationships with a programmatic locus have been/were attended to in the analysis.
 - Causal elements and relationships with an environmental locus have been/were attended to in the analysis.
 - Some analytical techniques have been/were applied which establish fault and confirms linkages between discrepancies and causes, in accordance with provisions for analysis in the evaluation design.
14. Decision rules have been/were posited in the evaluation design and applied in choosing to terminate, recycle, or advance relative to the identification of causes of discrepancies.
- Scientific criteria contribute to the primary substance of the decision rules.
 - Extra-scientific criteria (e.g., situational and/or subjective) are secondary verniers in the decision rules.

Alternative Generation

15. Alternative courses of action (adaptive or homeostatic) have been/were generated consistent with probable causation of discrepancy.
16. Decision rules have been/were posited in the evaluation design and applied in choosing to terminate, recycle, or advance relative to the generation of alternative courses of action pertinent to discrepancy.
- Scientific criteria have been/were primary contributors to the decision rules on generating alternatives.
 - Extra-scientific criteria have been/were admitted as secondary verniers in the decision rules on generating alternatives.

Reporting

17. Reports have been/were prepared to synthesize and disseminate evaluative judgment, in accordance with the evaluation design.
- a. Reports have a format which gives emphasis to background information, discrepancy statement, probable cause, list of alternatives, and recommendations.
 - b. Reports are characterized by completeness and utility.

Evaluative Criteria

18. The evaluation reflects adequate valuing of accepted criteria for evaluation.
- a. Scientific criteria are evident in the evaluation (viz, internal validity, external validity, reliability, objectivity).
 - b. Appropriate extra-scientific criteria have been/were considered in the evaluation (relevance, significance, scope, credibility, timeliness, pervasiveness).
19. Evaluative recommendations reflect a sensitivity to purposive change strategy.
- a. Recommendations tend to adjust operations to plan.
 - b. Elaboration of plan is called for where appropriate, by questioning objectives, specifications, and standards.

Selection and Modification

20. The choice of alternatives by the decision maker has been/was especially noted and tracked.

Formative Profile

21. Formative evaluation manifests a definite composition.
- a. Decision points have been non-programmed real-time events.
 - b. Emphasis has been on technical efficiency.
 - c. The scope of perspective has been infra-structure and micro-processes.
 - d. The locus of activity has been the internal field of action.

- e. The aim has been tactical control.
- f. The mode of operation has been to contain malfunction through negative feedback.

Summative Profile

- 22. Summative evaluation evinced consideration of theoretical adequacy.
 - a. Program syntality was explicated (e.g., content, techniques, media, mediator, participant, outcomes).
 - b. Program synergy was explicated in relationships of program elements, and the synthetic generation of more than the separate transformations by disparate elements will be included.
 - c. Dimensions of theoretical adequacy were used to appraise program syntality specifications.
 - d. Dimensions of theoretical adequacy were used to appraise program synergy specifications.
 - e. Dimensions of theoretical adequacy were used to appraise the problem definition.
- 23. Summative evaluation manifested a definite composition.
 - a. Decision points were programmed, discrete-time events.
 - b. Emphasis was on theoretical adequacy.
 - c. The scope of perspective was holistic supra-structure and macro-processes.
 - d. The locus of activity was external to the field of activity.
 - e. The aim was strategic control.
 - f. The mode of operation was to maximize behavior conducive to goal-attainment through positive feedback.
- 24. Summative evaluation made an inquiry into environmental effects on the program.
- 25. Summative evaluation included an inquiry on the relative cost-effectiveness of comparable programs.

Appendix J

Educational Evaluation Bibliography

Alameda County Schools. Fault Free Analysis, A Research Tool for Educational Planning, Technical Report No. 1. Hayward, California: Alameda County School Department PACE Center, October, 1966. (ED 029 379)

Alkin, Marvin C. Objectives and Objective-Based Measure Evaluation. Washington, D.C.: Office of Education, June, 1970. (ED 043 666)

. A Model for Educational Evaluation. Bethesda, Maryland: ERIC. (ED 036 898)

Appalachia Educational Laboratory. The Descriptive Design for the Educational Cooperative. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1972.

. A Strategy for Evaluation of the Educational Cooperative. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1970.

Ash, Robert. Information Theory. New York: Interscience Publishers, 1965.

Bellot, Fred K. Design for Tennessee Assessment and Evaluation of Title III, E.S.F.A. Memphis, Tennessee: Memphis State University, College of Education, Bureau of Educational Research and Service, 1969.

Berlak, Harold. "Values, Goals, Public Policy and Educational Evaluation," Review of Educational Research, XL(2):261-278, April, 1970.

Borg, Walter R. Three Levels of Evaluation for Educational Products. Bethesda, Maryland: ERIC, 1971. (ED 054 229)

Bressler, Marvin and Melvin M. Tumin. Evaluation of the Effectiveness of Educational Systems, Final Report, Volume I. Princeton: Princeton University, 1969. (ED 033 469)

Caldwell, Michael S. Input Evaluation and Educational Planning. Columbus, Ohio: Ohio State University, 1968. (ED 025 043)

Center for Effecting Educational Change. Evaluation and "PACE:" A Study of Procedures and Effectiveness of Evaluation Sections in Approved PACE Projects with Recommendations for Improvement. Report #1 of the second National Study of PACE. Fairfax, Virginia: Center for Effecting Educational Change, 1968. (ED 025 858)

Clark, Richard and John Rosenbach. Program Evaluators Handbook, Developing Solutions. Albany, New York: State University of New York, 1969. (ED 043 672)

Cook, Desmond L. Management Control Theory as a Context for Educational Evaluation. Columbus, Ohio: The Ohio State University Educational Program Management Center, 1970.

. "Management Control Theory as a Context for Educational Evaluation," Journal of Research and Development in Education. 3(4): 13-26, Summer 1970.

Cooperative Educational Research Lab. A Taxonomy of Programmatic Tasks in an Educational Evaluation Facilitation and Coordination System. Northfield, Illinois: Cooperative Educational Research Laboratory, Inc., 1969. (ED 035 975)

Coster, John K. and Robert L. Morgan. The Role of Evaluation in the Decision-Making Process, Center Occasional Paper No. 5. Raleigh, North Carolina: North Carolina University, 1969. (ED 042 028)

Danenburg, William. Perceptual Analysis of a Model Regional School Development Council. Unpublished Doctoral Dissertation, The University of Tennessee, 1970.

Dressel, Paul L. and Margaret F. Lorimer. "Institutional Self-Evaluation," Evaluation in Higher Education. Cambridge, Massachusetts: Houghton Mifflin Company, 1961.

Duncan, Merlin G. "An Assessment of Accountability, the State of the Art," Educational Technology. XI: 27-30, January, 1971.

Eidell, T. L. and J. A. Klebe. Annotated Bibliography on the Evaluation of Educational Programs. Eugene, Oregon: Oregon University 1968. (ED 025 857)

EPIC. A Scheme for Evaluation and An Organizational Structure of Variables. Tucson, Arizona: Educational Innovators Press, 1970.

Fels Institute. Educational Planning-Programming-Budgeting System Documentation Manual for School Districts, Version II, Model 1. Philadelphia, Pennsylvania: Pennsylvania University, Government Studies Center, 1969. (ED 037 814)

. Educational-Planning-Programming-Budgeting System, Documentation Manual for Intermediate Units, Version II, Model 1. Philadelphia, Pennsylvania: Pennsylvania University, Government Studies Center, 1969. (ED 037 816)

. Educational-Planning-Programming-Budgeting System, Procedures Manual for Intermediate Units, Version I, Model 2, Volumes I and II. Philadelphia, Pennsylvania: Pennsylvania University, Government Studies Center, 1969. (ED 037 813)

- General Design for an Educational-Planning Programming-Budgeting System. Philadelphia, Pennsylvania: Pennsylvania University, Government Studies Center, 1968. (ED 037 812)
- Ferresp do Roccaferrera, Giuseppe M. Sensitivity Analysis and the Managerial Decision Process. Syracuse, New York: Department of Management Science, Syracuse University, 1970.
- Finn, James D. "Institutionalization of Evaluation, Evaluation and "PACE": Catalyst for Change. Fairfax, Virginia: Center for Effecting Educational Change, 1969.
- Foley, Walter J. The Role of Educational Outcomes in Evaluation Strategy. Iowa City, Iowa: Iowa University, 1968. (ED 030 940)
- Ghorpade, Jaisingh. "Study of Organizational Effectiveness, Two Prevailing Viewpoints,": The Pacific Sociological Review. XIII: 31-40, Winter, 1970.
- Glässner, Leonard E. Handbook for Evaluators. Pittsburgh, Pennsylvania: Pittsburgh Public Schools, 1969. (ED 036 980)
- Gooler, Dennis D. Data Collection for Educational Decision-Making: Establishing Priorities. Urbana, Illinois: Illinois University, 1970. (ED 046 998)
- Grotelueschen, Arden D. and Dennis D. Gooler. A Role of Evaluation in Planning Educational Programs. Bethesda, Mar land: ERIC, 1971. (ED 052 221)
- Guba, Egon. "Evaluation Guidelines at the State Level," Evaluation and "PACE". Fairfax, Virginia: Center for Effecting Educational Change, 1968.
- Hanushek, Eric A. Developing Local Educational Indicators--The Priorities. Bethesda, Maryland: ERIC, 1970. (ED 046 083)
- Hatry, Harry P. Criteria for Evaluation in Planning State and Local Programs, A Study submitted by the Subcommittee on Inter-Governmental Relations to the Committee on Government Operations. Washington, D. C.: George Washington University, July, 1967.
- Hawkridge, David G. and Peggie L. Campeau. Developing a Guide for Authors of Evaluation Reports of Educational Programs, Final Report. Palo Alto, California: American Institutes for Research in the Behavioral Sciences, 1969. (ED 043 677)
- Hess, Robert J. and William J. Wright. Evaluation Strategies as a Function of Product Development Stages. St. Ann, Missouri: CEMREL, 1972. (ED 064 364)
- Husek, T. R. and Ken Sirotnik. Item Sampling in Educational Research. Los Angeles: Center for the Study of Evaluation, 1967.

- Inmegart, Glenn L., and Francis J. Pilecki. "Assessing Organizational Output, A Framework and Some Implications," Educational Administration Quarterly, 62-67, Winter, 1970.
- Irvine, David J. Performance Indicators in Education. Albany, New York: New York State Education Department, 1968. (ED 027 626)
- Jensen, Barry T., Stanley J. Terebinski, and William R. Ellis. The Journal of the American Society for Training and Development. 15(2): 307, February, 1961.
- Keeley, Benjamin. "Consequences of Change: A Case for Guidelines," College and University Business. XLVII: 57-59, October, 1969.
- Klein, Stephen P. and Marc - Andre Nadean. The Development and Field Testing of Evaluation Workshop I: An Orientation. Los Angeles: CSE, 1971.
- Kohl, J. W. and C. M. Achilles. A Basic Planning and Evaluation Model for Cooperation in Providing Regional Education Services. University Park, Pennsylvania: Center for Cooperative Research with Schools, College of Education, The Pennsylvania State University, February, 1970.
- Kravety, Nathan. The Evaluation of Educational System Outputs: An Exploratory Study. A Research Project. Paris: International Institute for Educational Planning, 1970. (ED 055 321)
- Lutz, Frank W., and Laurence Iannaccone. Understanding Organizations: A Field Study Approach. Columbus, Ohio: Charles E. Merrill Publishing Company, 1969.
- Mauch, James E. The Gathering and Use of Data. Bethesda, Maryland: ERIC, 1970. (ED 051 262)
- Merriman, Howard O. Evaluation of Planned Educational Change at the Local Education Agency Level. Columbus, Ohio: Evaluation Center, Ohio State University, February, 1967. (ED 025 042)
- Mullins, Norman. The Educational Cooperative Process, PART IV. Draft. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1972.
- Neyman, Clinton A., Jr. Evaluation of ESEA Title I Programs for the District of Columbia, 1967-68, Final Report. Washington, D. C.: George Washington University, 1969. (ED 049 319)
- North Central Association. Evaluative Criteria for the Evaluation of Secondary Schools, Fourth Edition. Washington, D. C.: American Council on Education, 1969.
- Northeast Regional Educational Laboratory. Rural Shared Services: Identification, Synthesis, Evaluation, and Packaging of Shared Service Research and Development Efforts in Rural Areas, Part I. Final Report for Phase I, and Interpretive Study Conducted under a U. S. Office of Education Contract by Northwest Regional Educational Laboratory, Portland, Oregon, 1969.

Perkins, Joseph A., Jr. PPBS and MIS., Their Role in Managing Education.
Bethesda, Maryland: ERIC 1969. (ED 030 961)

PROJECT DESIGN. Final Project Report, Final Internal Evaluation, Project Design, Interagency Planning for Urban Educational Needs. Fresno, California: Fresno City Unified School District, July, 1969. (ED 038 778)

Provus, Malcolm. Discrepancy Evaluation: For Educational Program Improvement and Assessment. Berkeley, California: McCutchan Publishing Corporation, 1971.

and G. Edward Lundin. "Evaluation for Administrative Action" Journal of Research and Development in Education. 3(4): 1-108, Summer, 1970.

Ranson, James T. Evaluation for Educational Development. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1970.

Roberson, E. Wayne (ed.). Educational Accountability through Evaluation. Englewood Cliffs, New Jersey: Educational Technology Publications, 1971.

Sanders, James R. and Blaine R. Worthen. "A Descriptive Summary of Framework for Planning Evaluation Studies," SRIS Quarterly. 5(1): 10-14, Spring, 1972.

Schalock, H. Del et. al. The Oregon Studies in Educational Research, Development, Diffusion, and Evaluation. Monmouth, Oregon: Oregon State System of Higher Education, 1972.

Scriven, Michael. "The Methodology of Evaluation", Perspectives of Curriculum Evaluation. Chicago: Rand McNally, 1967.

et al. An Evaluation System for Regional Labs and R & D Centers. Washington: USOE (NCERD), 1971. (ED 061 299).

Simon, Anita and E. Gil Boyer (eds.). Mirrors for Behavior: An Anthology of Observation Instruments Continued. Philadelphia, Pennsylvania: Research for Better Schools, Inc., 1970. (ED 031-613)

Simon, Herbert. The Sciences of the Artificial. Cambridge, Massachusetts: Massachusetts Institute of Technology Press, 1969.

Sirotnik, Kenneth. An Analysis of Variance for Matrix Sampling. Los Angeles: Center for the Study of Evaluation, 1969.

Skinner, B. F. "An Operant Analysis of Problem Solving," Benjamin Kleinmuntz (ed.), Problem Solving: Research, Method, and Theory. Pittsburgh, Pennsylvania: John Wiley and Sons, Inc., 1966.

Snyder, Walter. Bridging the Gap. Charleston, West Virginia: Kanawha County Schools, 1972.

Stake, Robert E. "PACE Evaluation," Evaluation and "PACE" / Fairfax, Virginia: Center for Effecting Educational Change, 1968.

- Stapp, Ermel. Planning Educational Systems Control. Ann Arbor, Michigan: University Microfilms, 1971.
- . Educational Evaluation: An Evaluation Instrument. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1972.
- . General Evaluation Design for the Educational Cooperative Program. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1972.
- . Special Evaluation Submodel for Educational Evaluation. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., forthcoming, 1972.
- Strevell, Wallace H. Rationale of Educational Evaluation. Pearland, Texas: Gulf Schools Supplementary Ed. Center, 1967. (ED 034 292)
- Stufflebeam, Daniel L. "The Use of Experimental Design in Educational Evaluation," Journal of Educational Measurement. 3(4): 267-274, Winter, 1971. (ED 045 706)
- . Design for Evaluating R & D Centers and Programs. Washington, D.C.: USOE (NCERD), 1971. (ED 061 298)
- . Educational Evaluation and Decision Making. Itasca, Illinois: F. E. Peacock Publishers, Inc., 1971.
- Tyler, Ralph W. (ED.). Educational Evaluation: New Roles, New Means, The Sixty-eighth Yearbook of the National Society for the Study of Education. Chicago: The National Society for the Study of Education, June, 1970.
- USOE. Testing and Further Development of an Operational Model for the Evaluation of Alternative Title I (ESEA) Projects. Washington, D.C.: Office of Education (DHEW), 1968. (ED 032 757)
- Welty, Gordon. Evaluation of Public School Programs. Pittsburgh: Pittsburgh Public Schools, July 1969. (ED 036 884)
- Wendt, Marilyn S. and Marjory E. Jacobson. A Study to Design, Develop, Implement, Evaluate, and Review Specific. Michigan: Bloomfield Hills School District, 1970. (ED 047 333)
- Williams, Walter and John W. Evans. The Politics of Evaluation: The Case of Head Start. Bethesda, Maryland: ERIC, 1969. (ED 045 690)
- Wohlferd, Gerald. Quality Evaluation Through Nomographs. Albany, New York: New York State University System, 1970. (ED 047 006)

Worthen, B. R. and J. R. Sanders. Educational Evaluation: Theory and Practice. Worthington, Ohio: Charles A. Jones, (in press).

Yost, Marlen and Frank J. Monnin. A Systems Approach to the Development of an Evaluation System for ESEA Title III Projects. Bethesda, Maryland: ERIC, 1969. (ED 047 356)

Appendix K

Cooperative Information System:
An Evaluation Instrument

Organizing Events

1. A statement of policy for Board approval encouraging the creation and maintenance of a Cooperative Information System was:
 - a. prepared by the Executive Director
 - b. submitted to the Board
 - c. based on a developed accompanying rationale
 - d. revised after review

2. A policy level group was formed to exercise exploratory and managerial functions.
 - a. Objectives of the policy level group have been stated.
 - b. Areas of representation were decided.
 - c. Members were appointed to the policy level group.
 - d. Functions of the policy group were identified.
 - (1) Exploratory
 - (a) delineation of information
 - (b) seeking information
 - (c) certifying the information
 - (d) translation into standards
 - (1) immediate directional objects
 - (2) evaluative backdrops
 - (2) Managerial
 - (a) organize and manage a design effort
 - (b) appraise design reports
 - (1) receive
 - (2) be conversant with
 - (3) evaluate

- (c) organize and manage an implementation effort
- (d) appraise implementation strategies and reports
 - (1) receive
 - (2) be conversant with
 - (3) evaluate
- (e) organize and manage a renewal effort
- (f) appraise renewal reports
 - (1) receive
 - (2) be conversant with
 - (3) evaluate

e. membership from top management

- (1) Board members
- (2) Executive Director
- (3) Key Cooperative staff members
- (4) District central office staff

3. A training program was developed and conducted.

a. Training needs were analyzed.

- (1) conceptual nature
- (2) structural and dynamic qualities of "play of action"
- (3) areas of operational responsibilities

b. Training objectives were stated.

c. A training strategy was chosen.

- (1) number and length of sessions
- (2) session leadership
- (3) material-member interaction

d. Orientation materials were prepared.

e. Training sessions were conducted.

f. Training sessions were evaluated.

- (1) conducted by Cooperative staff member
- (2) summative
- (3) follow-up areas identified

4. Training materials consisted of:

- a. Policy statement (with rationale)
- b. Policy group's objectives statement
- c. Information System Conceptual Profile
- d. Acquisition Process Profile
- e. Policy group role and Acquisition Process Profile

Defining the Problem

5. The information needs of Cooperative decision-making were defined.

a. Cooperative decision-makers were identified.

- (1) policy level/Board members
- (2) top management level/Executive Director
- (3) program management level/Program Coordinator

b. Decisional functions of the Cooperative were identified.

(1) Program decisional function:

- (a) Needs assessment
- (b) Rank priorities
- (c) Set standards
- (d) Generate alternatives
- (e) Select alternatives
- (f) Design and implement program
- (g) Program evaluation

(2) Program delivery decisional function

(3) Planning and Evaluation

(a) Monitor opportunities

(b) Plan Cooperative activities

(c) Program evaluation

(1) formative

(2) summative

(d) Long-range plans

(1) adequate

(2) realistic

(3) organizational

(4) Communications

(a) Maintain internal communications

(1) intra-Cooperative

(2) Cooperative-District

(b) Coordinate dissemination of program information to the public at large

(c) Assess outputs of participating districts

(5) Administrative Services

(a) Prepare and administer a budget

(b) Develop and maintain the organizational structure and appropriate administrative procedures

(c) Establish and administer procedures for the employment and training of personnel required for the efficient operation of the Cooperative.

c. Functions were attached to decision-makers

(1) Board functions (Cooperative objectives)

(a) select Executive Director

(b) establish objectives, policies, and plans

(c) analyze periodic program reports

- (d) establish safeguards
 - (1) properties
 - (2) funds
- (e) disseminating Cooperative information to member districts
- (f) selecting Advisory Council members, liaison, and consultation

(2) Executive Director

- (a) collecting and organizing district output information
- (b) recommending programs to Board
- (c) conduct program evaluations
- (d) assign and supervise personnel
- (e) prepare policies and regulations
- (f) prepare and administer budget
- (g) recommend personnel administration
- (h) establish and maintain mutually beneficial relationships with appropriate agencies and organizations
- (i) monitor support
- (j) manage facilities and equipment

(3) Program Directors

d. The central decision-making process was identified.

- (1) problem identification (needs)
- (2) rank priorities
- (3) set standards
- (4) generate alternatives
- (5) select alternatives
- (6) design program
- (7) implement program
- (8) evaluate program

- e. The decisional function of the Cooperative was classified.
 - (1) hierarchical levels X Process stages
 - (2) Structural components of the Cooperative Information System:
 - (a) objectives and policies
 - (b) assessment
 - (c) planning
 - (d) resource allocation and control
 - (e) administrative services
 - (f) program evaluation
- f. The kinds of information needed to support decision functions (by structural components).
- 6. Standards have been/were elaborated for the Cooperative Information System along the dimensions of:
 - a. performance
 - b. cost
 - c. time
- 7. Standards for the Information System have been/were ranked in priority.
- 8. Standards have been/were articulated to the design group by the policy group.
 - a. mutual understandings were elucidated
 - b. mutually acceptable reporting schedule for the design group have been/were worked out

Design and Information System

- 9. Design group has been/was responsible for producing several documents:
 - a. system specifications document
 - (1) system components
 - (2) data base

- (3) information flow
- b. document on operational procedures
- 10. The members of the design group have:
 - a. working knowledge and experience with systems analysis in organizations
 - b. specific knowledge in the design of information systems in organizations
 - c. knowledge of the Cooperative as an organization
 - d. specific experience in the design of information systems in organizations
- 11. Decisional criteria or expectations of the policy group for design products have been/were generated.
- 12. The policy group applied decisional expectation criteria to design products.

Implementing An Information System

- 13. The Information System has been/was tested.
 - a. Technical testing showed:
 - (1) the system could operate under field conditions
 - (2) formative alteration took place
 - b. Human testing revealed:
 - (1) attitudinal (distrust, reluctance, hostility, acceptance)
 - (2) capacity (assimilative, performance)
 - c. (Successful) pilot testing activities included:
 - (1) identifying specific applications
 - (2) preparing and/or acquiring the necessary material and equipment
 - (3) training personnel
 - (4) activating system
 - (5) evaluating and documenting all aspects of system performance

(6) refining specifications

(7) presenting revised specifications to the policy group

14. Full implementation of the Information System in the Cooperative was decided upon.

15. The Information System was installed Cooperative wide.

16. The Information System has been/was evaluated.

a. Operators evaluated the technical aspects of the system's structural and dynamic character.

(1) data files

(2) information flows

(3) data manipulating techniques

(4) data collection, processing, and delivery procedures

b. Users evaluated the worth of the system in terms of:

(1) purpose (in terms of standards)

(2) standards (adequacy)

Appendix L

Management Information Systems Bibliography

Andrew, Gary M. and Donald E. Moir. Information-Decision Systems in Education. Itasca, Illinois: Peacock Publishers, 1970.

ASM. Management Information Systems. Cleveland, Ohio: Association for Systems Management, 1972.

Bocchino, William A. Management Information Systems, Tools and Techniques. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1972.

Bumsted, Alec R. The Concept of Systems Management in Educational Data Processing, A Professional Paper. Santa Monica, California: Systems Development Corporation, 1969. (ED 047 353)

Chorness, M. H., C. H. Rittenhouse, and R. C. Heald. "Decision Processes and Information Needs in Education: A Field Survey." Berkeley, California: Far West Laboratory for Educational Research and Development, undated.

Dance, Frank E. X. (ed.). Human Communication Theory. New York: Holt, Rinehart and Winston, Inc., 1967.

ERIC/CLEM. Management Information Systems: Analysis of Literature and Selected Bibliography. Eugene, Oregon: ERIC Clearinghouse on Educational Administration, 1970.

Evans, J. A. A Framework for the Evolutionary Development of an Executive Information System. Bedford, Massachusetts: Mitre Corporation, 1968. (ED 029 376).

A Framework for the Evolutionary Development of an Executive Information System, OPERATION PEP, 1970.

A Framework for the Evolutionary Development of an Executive Information System, Part 1, Organizational Problem-Finding. Bedford, Massachusetts: Mitre Corporation, 1970. (ED 047 729)

A Framework for the Evolutionary Development of an Executive Information System, Part 2: System Design, Implementation, and Evolution. Bedford, Massachusetts: Mitre Corporation, 1970. (ED 047 730).

Farquhar, John and Barry Boehm. An Information System for Educational Management: Design Considerations (Volume I). Santa Monica, California: Rand Corporation, 1971.

Farquhar, John et. al. An Information System for Educational Management: Functional Design (Volume 4). Santa Monica, California: Rand Corporation, 1971.

Far West Laboratory for Educational Research and Development. Decision Processes and Information Needs in Education. Berkeley, California: FWLERD, undated.

Foley, Walter J. and Gordon G. Harr. Management Information System Project. Iowa City, Iowa: Center for Research in School Administration, Iowa University, 1972.

Goettel, Robert J. et al. Improving Information Systems for Educational Policy Making. Syracuse, New York: Policy Institute, Syracuse University Research Corporation, 1971. (ED 058 502)

- Iassey, William R. et al. Applications of Social-Science to Management Information Systems and Evaluation Process: A Peace Corps Model. A paper presented at the annual meeting of the Rural Sociological Society, Baton Rouge, Louisiana, August 25-27, 1972.
- Lewis, S. G. An Information System for a District School Administrator OPERATION PEP/Executive Information Systems. Bedford, Massachusetts: Mitre Corporation, 1970. (ED 051 551).
- _____. An Information System for a District School Administrator. OPERATION PEP, 1970.
- Loughary, John W. and Murray Tondow. Educational Information System Requirements, the Next Two Decades. Eugene, Oregon: Oregon University, 1967.
- Mullins, Norman. Cooperative Information System. Charleston, West Virginia: Appalachia Educational Laboratory, Inc. 1972.
- Ott, Jack M. Taxonomy of Administrative Information Needs: An Aid to Educational Planning and Evaluation. Paper presented at the Annual Meeting of the AERA, Minneapolis, March, 1970.
- Palmer, Kay W. Educational Management Information System: Systems Design. Carson City, Nevada: Nevada State Department of Education, 1972.
- Rittenhouse, Carl H. and Maury H. Chorness. A Survey of the Decision Processes and Related Informational Requirements for Educational Planning and Innovation. Bethesda, Maryland: ERIC, 1969. (ED 041 357).
- Rosenblatt, D. A Note on Communication in Organizations. Pittsburgh: Carnegie Institute of Technology, 1951.
- Ross Joel E. and Robert G. Murdick. An Annotated Bibliography of Management Information Systems. Cleveland, Ohio: Association for Systems Management, 1970.
- Summers, J. K. and J. E. Sullivan. The State of the Art in Information Handling. OPERATION PEP/Executive Information Systems. Bedford, Massachusetts: Mitre Corporation, 1970. (ED 051 552).
- Witkin, Belle Ruth. Management Information Systems: Applications to Educational Administration. Hayward, California: Alameda County Schools, 1971.
- Zegarac, Elizabeth N. et al. Information Systems: Annotated Bibliography of Related Literature: Prepared for Six Midwestern States Consortium. Kansas City, Missouri: Mid Continent Regional Educational Laboratory, Inc. 1971. (ED 052 798).

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Appendix M

Business Management in an Educational Cooperative:
An Evaluation Instrument

Business Management

1. Purchasing guidelines were/have been written into official policy.
 - a. Purchase orders were/have been treated in official written policy.
 - b. Requisitions were/have been covered by official written policy.
 - c. Payment of invoices was/has been covered by official written policy.
 - d. Quantity purchasing was/has been covered by official written policy.
 - e. Competitive bidding was/has been covered by official written policy.
 - f. Issues of supplies was/has been covered by official written policy.
 - g. Petty cash funds were/have been covered by official written policy.
2. All purchasing actions were/have been guided by:
 - a. product appropriateness,
 - b. appropriate relationship between quantity and cost,
 - c. product availability when needed,
 - d. proper price.
3. Financial accounting guidelines were/have been rendered to official written policy.
 - a. Initial recording of financial data was/has been ensured.
 - b. Accounting for available funds was/has been achieved.
 - c. Budgetary procedures were/have been established.
 - d. A sound basis for cost accounting was/has been established.
 - e. Comparisons of financial information among Cooperative programs (and other similar programs in the state) were/have been facilitated.

- f. The accuracy of Cooperative planning and research activities was/has been improved.
- g. Reliable reporting to the governing board and public on the conditions and progress of Cocperative efforts was/has been facilitated.
4. Property management guidelines were/have been written into official policy (receipt, storage, and disbursement of supplies, equipment, and property).

Action	Possession		
	Receipt	Storage	Disbursement
Supplies	_____	_____	_____
Equipment	_____	_____	_____
Property	_____	_____	_____

- a. Executive Director was/has been delegated responsibility for property management.
- b. Property management procedures were/have been easily understood by employees.
5. Personnel management guidelines were/have been written into policy (e.g., travel, monthly expense accounts, employee records, bonding).

Appendix N

Personnel Management in the Educational Cooperative:
An Evaluation Instrument

PERSONNEL MANAGEMENT

1. Personnel procurement policies were/have been developed.
 - a. Personnel recruitment was/has been covered by policy.
 - b. Recruitment procedures were/have been delineated for the implementation of policy.
 - (1) accepting applications
 - (2) search
 - (3) year-round continuation
 - (4) careful planning
 - c. Personnel selection was/has been covered by policy.
 - (1) systematic procedure
 - (2) variety of appraised techniques
 - (a) complete
 - (b) reliable
 - (3) job descriptions and specifications
 - (4) comprehensive application forms
 - (5) checking credentials
 - (6) personal interviews
 - (7) observation of candidates
 - (8) permanent personnel folders
 - d. Procurement procedures were/have been characterized by:
 - (1) definite purpose
 - (2) interrelatedness
 - (3) verification
 - (a) personal correspondence
 - (b) telephone communication

2. Personnel utilization was/has been formally written into policy.
 - a. Personnel placement policy was/has been written.
 - (1) Cooperative needs were/have been pre-imminent in the placement policy.
 - (2) Assignment for effective service is required.
 - b. Personnel orientation was/has been affirmed in written policy.
 - (1) General working conditions are/have been included in the orientation.
 - (2) Grievance procedures are/have been included in the orientation.
 - c. Primary responsibilities were/have been identified for each position.
3. A compensation policy was/has been written.
 - a. Fair pay was/has been made imperative by policy.
 - (1) A salary schedule was/has been used by the Cooperative.
 - (a) A minimum pay is given for each position.
 - (b) A maximum pay is given for each position.
 - (c) Periodic increments are given for each position.
 - (d) The salary schedule compares favorably with schedules of similar organizations.
 - (2) Initial pay reflects:
 - (a) responsibility
 - (b) experience
 - (c) training
 - (d) skills
 - b. Group insurance was/has been made imperative by written policy.
 - (1) Health insurance was/has been provided by policy.

- (a) Health insurance provides hospitalization.
 - (b) Health insurance provides surgical coverage.
 - (c) Health insurance provides major medical coverage.
- (2) Life insurance was/has been provided by policy.
- (3) Accident and sickness insurance was/has been provided by policy.
- c. Personnel leave was/has been allowed by written policy for:
- (1) sickness
 - (2) vacation
 - (3) emergency
 - (4) maternity
 - (5) military duty
4. A personnel development policy was/has been developed.
- a. Personnel growth was/has been provided in written policy.
- b. Personnel evaluation was/has been provided by written policy:
- (1) validity
 - (2) credibility
 - (3) acceptability
 - (4) effectiveness
 - (5) composite ratings
 - (6) conferences
 - (7) identification of strengths
 - (8) identification of weakness
- c. Personnel records were/have been provided by written policy to contain:
- (1) educational background data
 - (2) experience record

- (3) salary history
 - (4) professional growth history
5. A written policy on the separation of personnel was/has been developed.
 - a. Dismissal action is provided by policy.
 - b. Voluntary resignation is provided by policy.
 - c. Retirement is provided by policy.
 6. Resources for personnel management are provided by policy.
 - a. A staff for personnel management is provided by policy.
 - b. Facilities for personnel management are provided by policy.
 7. The formulation of personnel policy requires the approval of the Board of Directors.
 8. The Executive Director was/has been involved in the formulation of personnel policy.
 - a. The Executive Director recommended policy to the Board.
 - (1) new policy
 - (2) revised policy
 - b. The Executive Director defined policy problems for the Board.
 - c. The Executive Director suggested alternative policies on each problem.
 - d. The Executive Director furnished the Board information on each policy problem.
 - e. The Executive Director advised the Board on the appropriateness of policy alternatives.
 - f. The Executive Director shared with the Board the appraisal of policies.
 9. Written policies on the administration of policies were/have been developed.
 - a. The nature of policies as guidelines for action was/has been affirmed by policy.

- (1) The serious impairment of freedom to search for alternative goals and means was/has been precluded by policy.
 - (2) The discouragement of initiative was/has been precluded by policy.
 - (3) Provision was/has been made by policy for changing policy.
 - (4) Integration and interrelatedness of policy was/has been required by policy.
- b. Responsibility for the administration of policy was/has been delegated to the Executive Director by the Board.
- c. The relationship between the Executive Director and the Board was/has been clearly demarcated.
10. Each policy of the Educational Cooperative was/has been formally written.
 11. Procedures to implement policies were/have been prescribed.
 12. Periodical review was/has been provided for personnel policy management.

Appendix O

Policy - Making Bibliography

Campbell, Roald F. et al. Policy Making for American Public Schools.
Stanford, California: National Academy of Education, 1969. (ED 041 385)

Carroll, Michael A. Human Values as Planning Policy Determinants.
Bethesda, Maryland: ERIC, 1970. (ED 048 633).

Dahl, Robert A. Who Governs? Democracy and Power in an American City.
New Haven, Connecticut: Yale University Press, 1961.

Dickinson, William E. Development of a School Board Policy Codification System and School Board Policy Information Clearinghouse, Final Report.
Evanston, Illinois: National School Boards Association, 1970.
(ED 037 822).

Dror, Yehezkel. "Policy Analysts: A New Professional Role in Government Service," Public Administration Review. (September, 1967). 27(3): 197-203.

_____. Policy Sciences: Developments and Implications. Bethesda, Maryland: ERIC, 1970. (ED 052 521).

_____. "Prolegomena to Policy Sciences," Policy Sciences, I:135-150, Spring, 1970.

_____. Public Policy-Making Re-examined. San Francisco: Chandler, 1968.

_____. Some Normative Implications of a Systems View of Policy-Making. Bethesda, Maryland: ERIC, 1969. (ED 052 522).

_____. "Urban Metapolicy and Urban Education," Educational Technology, X:15-21, September 1970.

Dye, Thomas R. Policy Outcomes in Public Education. Bethesda, Maryland: ERIC. (ED 011 684).

Edelman, Murray. "Escalation and Ritualization of Political Conflict," American Behavioral Scientist, XIII:231-246, November-December, 1969.

Elboin-Dror, Rachel. "Some Characteristics of the Education Policy Formation System," Policy Sciences, I:231-253, Summer, 1970.

Harrison, Roger. "Choosing the Depth of Organizational Intervention," The Journal of Applied Behavioral Science, VI:181-202, April/May/June, 1970.

Hencley, Stephen. "Innovation and School Policy," Educational Leadership, XXV:308-311, January, 1968.

Higginson, M. Valliant. Management Policies I. New York: American Management Association, 1966.

_____. Management Policies II. New York: American Management Association, 1966.

Howard, A. Eugene. Determining Educational Policy: Who Shall Be Involved. Bethesda, Maryland: ERIC, 1970. (ED 046 125).

- Hunter, Floyd. Community Power Structure: A Study of Decision-Makers. Chapel Hill, North Carolina: University of North Carolina Press, 1953.
- Kimbrough, Ralph B. Political Power and Educational Decision-Making. Chicago: Rand McNally and Company, 1964.
- Milstein, Mike M. and Robert E. Jennings. Perceptions of the Educational Policy-Making Process in New York State: Educational Interest Group Leaders and State Legislators. Bethesda, Maryland: ERIC, 1971. (ED 047 365)
- Mort, Paul R. and Orlando F. Furno. "Theory and Synthesis of a Sequential Simplex: A Model for Assessing the Effectiveness of Administrative Policies." New York: Institute of Administrative Research, Teachers College, Columbia University, 1960.
- Moses, Stanley. Towards a New Conceptual Framework for Educational Policy. Bethesda, Maryland: ERIC, 1970 (ED 048 634)
- National School Boards Association. Policies for Improving School Board Meetings. Waterford, Connecticut: NS 13A, 1970. (ED 047 363)
- Sandow, Stuart A. Educational Policy Formulation: Planning with the Focus Delphi and Cross Purpose Matrix. Syracuse, New York: Educational Policy Research Center, 1972. (ED 061 634)
- Shannon, Thomas A. The Effectiveness of Written Board Policies. Bethesda, Maryland: ERIC, 1966. (ED 043 095)
- Stepp, Ermel et al. General Evaluation Design for the Educational Cooperative Development Program. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 197
- . Policy-Making in an Educational Cooperative: An Evaluation Instrument. Charleston, West Virginia: Appalachia Educational Laboratory, 1972.
- . Special Evaluation Submodel for Policy-Making in an Educational Cooperative. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., forthcoming, 1972.
- Wilcox, Hayes. Business Management Guidelines for an Educational Cooperative. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1972.
- . Policy-Making Guidelines for Educational Cooperative. Charleston, West Virginia: Appalachia Educational Laboratory, Inc., 1972.

Appendix P

- Policy-Making in the Educational Cooperative:
An Evaluation Instrument

Definitions and Rationale

1. Distinct advantages of written policy were/have been:
 - a. Administrative and managerial decisions achieved greater consistency.
 - b. Valuable resources were conserved by resolving variations of the same question under one policy.
 - c. An atmosphere conducive to good public relations was created.
 - d. Conflicts and pressures were managed more adequately.
 - e. Criticism of managerial and administrative actions were reduced.
 - f. Review and evaluation of administrative actions was facilitated.
 - g. Better communications channels were opened.
 - h. Variety in interpretations was avoided.
 - i. Responsibilities were clearly delineated for:
 - (1) Cooperative Board
 - (2) Executive Director
 - (3) Cooperative Staff
2. Stages in policy development have been/were:
 - a. Recognition of need in a specific area
 - b. Authorization of development activity
 - c. Development
 - d. Review
 - e. Revision
 - f. Adoption
 - g. Administration
 - h. Communication

3. The Cooperative Board exercised duties in stages of policy development:
 - a. Recognize need for policy.
 - b. Authorize policy development.
 - c. Review policy.
 - d. Approve policy.
4. The Executive Director exercised duties in stages of policy development:
 - a. Recognize need for policy.
 - b. Develop policy.
 - c. Revise policy.
 - d. Administer policy.
5. The Cooperative Staff exercised duties in stages of policy development:
 - a. Recognize need for policy.
 - b. Review policy.
 - c. Communication of policy.

Suggested Policy Development

6. An official organizational name was adopted in policy.
 - a. confederative designation?
 - b. unique?
 - c. brief?
 - d. identifier?
7. Organizational composition as a confederation was stated in policy.
 - a. Each participating agency was designated.
 - b. The type of membership of each participating agency was designated.
8. Official organizational charts were presented in policy relative to:

- a. the institutional role set of the Educational Cooperative
 - b. the intra-Cooperative communication channels
9. Written policy included provision for preparing and revising a statement of philosophy.
10. Written policy indicated the objectives of the organization.
11. Written policy affirmed a commitment to the Cooperative Process:
- a. Needs Assessment
 - b. Problem Definition
 - c. Ranking Priorities
 - d. Setting Standards
 - e. Generating Alternatives
 - f. Selecting Alternatives
 - g. Program Specifications
 - h. Program Implementation
 - i. Program Evaluation
12. Written policy provided legality to the governing function of the Cooperative Board of Control.
- a. Control
 - b. Composition
 - (1) Superintendents
 - (2) Representatives
 - (a) State Department
 - (b) Institution of Higher Education
 - (c) Others
 - c. Proxy representation
13. Written policy expressed the voting rights inherent in membership on the Cooperative Board.
14. Written policy indicated the duties and responsibilities of the Cooperative Board.

- a. Selecting the Executive Director
 - b. Establishing organizational
 - (1) objectives
 - (2) policies
 - (3) overall plans
 - c. Evaluating and approving policies and plans proposed by the Executive Director
 - d. Analyzing periodic program reports
 - e. Establishing adequate safeguards relative to:
 - (1) properties
 - (2) funds
 - f. Disseminating information to member school districts regarding accomplishments of the Cooperative
 - g. Selecting members for an Advisory Council
 - (1) liaison procedures
 - (2) consultation procedures
15. Written policy delineated the events crucial to the Cooperative Process
- a. Board actions
 - b. Executive Director's actions
16. Written policy indicated the responsibility for organizing and maintaining an Advisory Council.
17. Written policy identified the responsibilities of the Executive Director:
- a. Executive Director was designated as chief officer of the Board.
 - b. Executive Director recommends appropriate policies for the Board's consideration.
 - c. Executive Director implements and executes policies adopted by the Board
 - d. Executive Director presents program information to the Board.

- e. Executive Director assures workable Cooperative-community relations.
- f. Executive Director participates in community activities.
- g. Executive Director nominates candidates for staff positions with care.
- h. Executive Director recommends purchases of equipment and supplies.
- i. Executive Director presents budget to Board for approval.
- j. Executive Director administers the budget.
- k. Written policy requires congruence with specifications relative to the responsibilities of the Executive Director:
 - (1) collect and organize district output information
 - (2) recommend programs
 - (3) conduct comprehensive program evaluations
 - (4) assign and supervise all personnel
 - (5) prepare policies and regulations
 - (6) prepare and administer a budget
 - (7) make recommendations on personnel administration
 - (8) establish and maintain mutually beneficial relationships with appropriate agencies and organizations
 - (9) monitor the environment for sources of financial support
 - (10) administer all facilities and equipment
- 18. Written policy governed the conduct of meetings of the Board.
- 19. Written policy required a Cooperative Information System.
- 20. Written policy required a public relations program.
- 21. Written policy called for a periodic review of policy.

Appendix Q

Content of Minutes of Board of Directors:
An Evaluation Instrument

Content Categories*

- 01 Extractive (Curriculum) Demand Input
- 02 Extractive (Instruction) Demand Input
- 03 Extractive (Personnel) Demand Input
- 04 Extractive (Business) Demand Input
- 05 Symbolic (Meetings) Demand Input
- 06 Symbolic (Publication) Demand Input
- 07 Symbolic (Tributes) Demand Input
- 08 Symbolic (Programs) Demand Input
- 09 Material Support Input
- 10 Obedience Support Input
- 11 Deference Support Input
- 12 Articulation, Political Conversion
- 13 Aggregation, Political Conversion
- 14 Rule Making, Governmental Conversion
- 15 Rule Application, Governmental Conversion
- 16 Rule Adjudication, Governmental Conversion
- 17 Demand Communication
- 18 Support Communication
- 19 Extraction Output
- 20 Regulation Output
- 21 Symbol Output
- 22 Allocation Output

*Adapted from J. D. Scribner, A Functional-Systems Analysis of School Board Performance (Ann Arbor: University Microfilms, 1966).

Appendix R

School Boards Bibliography

- Banahart, Frank W. Educational Systems Analysis. New York: The Macmillan Company, 1969.
- Bass, Bernard M. Organizational Psychology. Boston: Allyn and Bacon Inc., 1965.
- Bereiter, Carl. "Multivariate Analyses of the Behavior and Structure of Groups and Organizations," Raymond B. Cattell (ed.), Handbook of Multivariate Experimental Psychology. Chicago: Rand McNally and Company, 1966.
- Bernardo, Charles M. School Board Member Characteristics and Fiscal Responsibility. Columbia University, New York Institute of Administrative Research, 1967. (ED 023 154)
- Carter, Richard F. et al. The Structure and Process of School-Community Relations, Vol. I Informal Communication About Schools. Stanford University, California Institute for Community Research, 1966. (ED 017 054)
- _____. The Structure and Process of School-Community Relations, Vol. III, The Structure of School-Community Relations. Stanford University, California Institute for Community Research, 1966. (ED 017 056)
- Carter, Richard F. and Steven H. Chaffee. The Structure and Process of School-Community Relations, Vol. II, Between Citizens and Schools. Stanford University, California Institute for Community Research, 1966. (ED 017 055)
- _____ and W. Lee Ruggels. The Structure and Process of School-Community Relations, Vol. IV, The Process of School-Community Relations. Stanford University, California Institute for Community Research, 1966. (ED 017 057)
- _____ and William R. Odell. The Structure and Process of School-Community Relations, Volume V, A Summary. Stanford University, California Institute for Community Research, 1966. (ED 017 058)
- Carzo, Rocco, Jr. and John N. Yancuyas. Formal Organization: A System Approach. Homewood, Illinois: The Dorsey Press, 1967.
- Cattell, Raymond B. "The Dimensions of Culture Patterns by Factorization of National Characters," Journal of Abnormal Social Psychology, 44, 443-469, 1949.
- _____. "Cultural and Political-Economic Psychology," Raymond B. Cattell (ed.), Handbook of Multivariate Experimental Psychology. Chicago: Rand McNally and Company, 1966.
- Dudley, Charles Jackson. Task Structure, Allocation of Power, and Satisfaction of Organization Members in Six Schools. Eugene, Oregon: Center for Advanced Study of Education Administration, 1969. (ED 035 094)

- Eckel, Howard. Developing and Testing Research Instruments for Role Analysis of Educational Administrators Emphasizing Devices to Study Relationships Between Variable Definitions of Educational Administrative Activities, Style, and Norms, and Role Conflict and Ambiguity, Final Report. Lincoln, Nebraska: Nebraska University, 1969. (ED 043 133)
- ERIC/CEA. Alternative Organizational Forms, Analysis of Literature and Selected Bibliography. Eugene, Oregon: ERIC Clearinghouse on Educational Administration, 1970. (ED 043 111)
- Foa, Uriel. "The Structure of Interpersonal Behavior in the Dyad," Joan Criswell, Herbert Soloman, and Patrick Suppes (editors), Mathematical Methods in Small Group Processes. Stanford, California: Stanford University Press, 1962.
- Hickcox, Edward S. Power Structures, School Boards, and Administrative Style. Eugene, Oregon: University of Oregon, 1967. (ED 012 510)
- _____ et al. A Model for School Board Operation. Bethesda, Maryland: ERIC. (ED 026 723)
- Jongeward, Ray and Frank Heesacker. Sharing Educational Services, Prep-XIII. Portland, Oregon: Northwest Regional Educational Laboratory, 1969.
- Kimbrough, Ralph B. Community Power Systems and Strategies for Educational Change. Bethesda, Maryland: ERIC, 1966. (ED 025 551)
- Lipham, James M. et al. The School Board as an Agency for Resolving Conflict. Madison, Wisconsin: Wisconsin University, 1967. (ED 016 280)
- McCarty, Donald J. Myths and Reality in School Board Research. Washington: American Educational Research Association, 1966. (ED 010 711)
- Pellegrin, Roland J. Community Power Structure and Educational Decision-Making in the Local Community. Eugene, Oregon: University of Oregon, 1965. (ED 010 218)
- Rosier, Melvin E. "The Pennsylvania Study Council as an Agency for Educational Change." Unpublished Doctoral dissertation, the Pennsylvania State University, 1965.
- Scribner, Jay Donald. "A Functional-Analysis of School Board Performance." Unpublished Doctoral dissertation, Stanford University, 1966.

Appendix S

Effectiveness of the Educational Cooperative:
An Evaluation Instrument

I. Criterion Variables

A. Descriptive Panel

1. Inclusion: to include in a given Educational Cooperative any school districts which can be served with satisfaction.
2. Control: to govern the Educational Cooperative through a policy board, which delegates administrative responsibility for the Cooperative to an Executive Director.
3. Fiscal Investment: to move toward greater local investment in the Educational Cooperative.
4. Cooperative Rationality: to make decisions on programs on the basis of planning and evaluation.
5. Regionality: to operate regional educational programs with optional participation by school districts.

B. Performance Panel

1. Cost-effectiveness: making programs available, for the participating districts, with desired benefits at less expense.
2. Local Rationality: influencing participating districts to analyze educational problems and devise solutions in an orderly, rational manner.
3. Reallocation: influencing participating districts to reallocate resources in order to achieve desirable educational outcomes.
4. Resourcefulness: bringing resources of other organizations (particularly state departments of education and institutions of higher education) to bear upon the problems of participating districts.

II. Descriptive Panel

A. Inclusion

1. Contiguity: identify the district boundaries of members of the Cooperative on an official map of the region, and note the lack of disjointed members not sharing a border with another member.
2. Unitary Intersection: note the mapped intersection of the Cooperative area and the adjoint planning and development district, and identify and enumerate those Cooperative members in the intersection.

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3. Contractual Complement: identify and enumerate any Cooperative members not contained in the mapped intersection of the Cooperative area and the adjoint planning and development district.
4. Conditions: identify any conditions of membership imposed by the Cooperative.
5. Radius: (Scaled maps of the Cooperative area shall be used, with speed zone data from the state highway agency.) Determine whether the Cooperative service area is less than or equal to one-hour driving time.
6. Enrollment: the Cooperative's pupil population will be determined from school district data to determine if that population is between specified limits.

B. Control

1. Board Superintendents: the intersection of the sets of superintendents in the Cooperative area and on the Cooperative's Board of Directors shall be inspected to identify and enumerate elements of equivalence.
2. Board Representatives: official acceptance of identified legitimate interest of members of the Board of Directors who are not superintendents in the Cooperative region shall be identified and cited.
3. Executive Director: the contract of employment of the Executive Director shall be inspected and verified.
4. Output Evaluation: inspect instruments, data summaries, and reports on output.
5. Program Evaluation: inspect instruments, data summaries, and reports on programs.
6. Personnel Assignment: read and verify contracts of Cooperative employees.
7. Budget Preparation: inspect budget prepared by the Executive Director.
8. Facility Administration: determine who has responsibility for facility management.
9. Equipment Administration: determine who has responsibility for equipment management.
10. Program Recommendations: read, classify, and enumerate specific program recommendations by the Executive Director.

11. Policy Generation: read, classify, and enumerate policies (and regulations) generated by the Executive Director.
12. Policy Approval: read, classify, and enumerate approvals by the Board of policies generated by the Executive Director.
13. Interagency Relations: identify, classify, and enumerate contacts with other agencies, including correspondence and documented conferences.
14. Support Monitor: identify, classify, and enumerate supporting agencies which have been monitored by the Executive Director.
15. Support Query: identify, classify, and enumerate queries by the Executive Director relative to gaining support for the Cooperative.
16. Support Proposal: read, classify, and enumerate any proposals of the Executive Director aimed at getting support for the Cooperative.
17. Personnel Recommendations: read, classify, and enumerate any personnel recommendations by the Executive Director.

C. Investment

1. Local Contribution Rate: verify contribution rates through official documentation.
2. Local Revenue: verify receipt of local revenue, and state amounts.
3. Outside Revenue: verify receipt of outside revenue, and state amounts.

D. Regionality

1. Implementation: identify and enumerate all school districts of the Cooperative in which each program is operated, and visit each scene.

E. Rationality

1. Needs Assessment: inspect any instruments, data summary, and report(s) identifying needs. List needs. Administer needs assessment instrument.
2. Priority Setting: identify list of needs in order of importance. Administer planning instrument section on setting priorities.

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3. Setting Standards: cite standards for each program. Administer planning instrument section on setting standards.
4. Alternatives Generated: document alternatives considered in arriving at each program. Administer planning instrument section on generating alternatives.
5. Selection of Alternatives: document the consideration of each method selected as the most promising one. Administer program instrument on choice.
6. Program: study each program, and visit operational scenes. Administer program instrument on design and implementation.
7. Evaluation: audit evaluations of new programs, noting whether results of such programs were analyzed. Administer evaluation instrument.

III. Performance Panel

A. Cost-Effectiveness

1. Capital Cost: sum expenditures and outlay for buildings and grounds incurred by the Cooperative in the operation of specific programs.
2. Material Cost: sum expenditures for equipment and supplies incurred by the Cooperative in the operation of specific programs.
3. Personnel Cost: sum salaries for personnel paid by the Cooperative in the operation of specific programs.
4. Effectiveness: determine program effectiveness.

B. Reallocation

1. Capital Differential: determine the change in the shared value of buildings and grounds used in the operation of programs.
2. Material Differential: determine the change in the cost of equipment and supplies used in the operation of programs, including prorated shares.
3. Salary Differential: determine the change in the salaries of personnel required to operate programs.

C. Resourcefulness

1. Capital Resource: determine the value of buildings and grounds used by the Cooperative which was contributed by other organizations.
2. Material Resource: determine the value of equipment and supplies contributed by other organizations to the Cooperative.
3. Personnel Resource: determine the value of personnel man-hours contributed by other organizations to the Cooperative.
4. Financial Resource: determine the revenue contributed to the Cooperative by other organizations.

Appendix T

Organizational Management: Theory

- Apter, Michael. Cybernetics and Development. New York: Pergamon Press, 1968.
- Archibald, R. and R. Villoria. Network Based Management Systems. New York: John Wiley and Sons, Inc., 1967.
- Ashby, N. Ross. An Introduction to Cybernetics. New York: John Wiley and Sons, Inc., 1956.
- Association for Systems Management. An Annotated Bibliography for the Systems Professional. Cleveland, Ohio: Association for Systems Management, 1970.
- Bartos, Bruce B. A Review of Instruments Developed to be Used in the Evaluation of the Adequacy of Reported Research. Bloomington, Indiana: Phi Delta Kappa, 1969. (ED 051 284)
- Baumgartner, John Stanley. Project Management. Homewood, Illinois: Richard D. Irwin, Inc., 1963.
- Beckhard, Richard. Organizational Development: Strategies and Models. Reading, Massachusetts: Addison-Wesley Publishing Company, 1969. (ED 037 623)
- Beer, Stafford. Cybernetics and Management. New York: John Wiley and Sons, Inc., 1966.
- _____. Decision and Control. London: John Wiley and Sons, 1966.
- Bennis, Warren G. Organization Development: Its Nature, Origins, and Prospects. Reading, Massachusetts: Addison-Wesley Publishing Company, 1969.
- Berrien, Kenneth F. General and Social Systems. New Brunswick: Rutgers University Press, 1968.
- Bertalanffy, Ludwig von. General System Theory. New York: George Braziller, Inc., 1968.
- _____. "General System Theory - A Critical Review," Walter Buckley (editor). Modern Systems Research for the Behavioral Scientists. Chicago: Aldine Publishing Company, 1968.
- Blanchard, Gary F. and Desmond L. Cook. "Project Management and Educational Change." Columbus, Ohio: Ohio State University, March, 1970.
- Booth, Taylor I. Sequential Machines and Automata Theory. New York: John Wiley and Sons, Inc., 1967.
- Braybrooke, D. and C. E. Lindblom. A Strategy of Decision. New York: Free Press, 1963.

- Bross, Irwin D. J. Design for Decision. New York: Macmillan Company, 1953.
- Broudy, Harry. Criteria for the Theoretical Adequacy of Conceptual Framework of Planned Educational Change. Bethesda, Maryland: ERIC, 1965. (ED 010 914)
- Buckley, Walter (ed.). Modern Systems Research for the Behavioral Scientist. Chicago: Aldine Publishing Company, 1968.
- _____. Sociology and Modern Systems Theory. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1967.
- Campbell, Donald T. Exploration of Novel Research Designs and Measurement Techniques. Evanston, Illinois: Northwestern University, 1965. (ED 003 389)
- Center for Effecting Educational Change. PACE: Catalyst for Change. Report No. 6 of the Second National Study of PACE. Fairfax, Virginia: Center for Effecting Educational Change, 1968.
- Chase, Clinton I. Institute in Research Design and Evaluation, Final Report. Bloomington, Indiana: Indiana University, 1968. (ED 034 323)
- Cleland, D. I. and W. R. King. Systems Analysis and Project Management. New York: McGraw-Hill Book Company, 1968.
- Coney, Robert et al. Educational R and D Information System Requirements, A Task Force Report. Berkeley, California: Far West Lab for Educational Research and Development, 1968. (ED 022 441)
- Cook, Desmond L. "A Conceptual Framework for the Study of Project Management in Education." Final Report Project No. 1200-121299-308 Research Committee, College of Education, The Ohio State University. Paper presented at Third Annual Seminar/Symposium of Project Management Institute, Houston, Texas, October, 1971.
- _____. Educational Project Management. Columbus, Ohio: Charles E. Merrill Company, 1971.
- _____. A Generalized Project-Management System Model. Columbus, Ohio: Ohio State University, November, 1968.
- _____. The Nature of Project Management. Columbus, Ohio: Ohio State University, June, 1968.
- _____. "An Overview of Management Science in Educational Research." Paper presented at a Symposium on Management Science in Educational Research, 15th Annual Meeting of the Institute of Management Sciences, Cleveland, September, 1968.
- _____. Research Management--Of What Nature Is the Concept. Columbus, Ohio: Educational Program Management Center, Ohio State University, 1969. (ED 031 786)

- Cook, Desmond L. et al. An Investigation of the Responsibilities and Duties of Educational Project Managers. Columbus, Ohio: Ohio State University, 1970. (ED 046 096)
- Croft, Don B. and Adolph J. Koenig (editors). Application of Research Management Techniques. Las Cruces, New Mexico: Special Interest Group on Research Management, New Mexico State University, 1971.
- Culbertson, Jack A. and Stephen P. Hencley (editors). Educational Research: New Perspectives. Danville, Illinois: The Interstate Printers and Publishers, Inc., 1963.
- Dubin, Robert. Theory Building. New York: The Free Press, 1969.
- Dyer, Henry S. "An Educational Researcher's View of Systems Analysis." Paper presented at the Annual Meeting of the American Educational Research Association, Los Angeles, February, 1969.
- ERIC/CLEM. Alternative Organization Forms: Analysis of Literature and Selected Bibliography. Eugene, Oregon: ERIC Clearinghouse on Educational Administration, September, 1970.
- Etzioni, Amitai. Modern Organizations. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1964.
- Feldman, Julian. "Organizational Decision Making," James G. March (editor), Handbook of Organizations. Chicago: Rand McNally and Company, 1965.
- Forehand, Garlie A. "Epilogue: Constructs and Strategies for Problem-Solving Research," Benjamin Kleinmuntz (editor), Problem-Solving: Research Method and Theory. Pittsburgh: John Wiley and Sons, 1966.
- Gephart, William J. Criteria for Methodological Adequacy for Research on Educational Change. Bethesda, Maryland: ERIC, 1965. (ED 011 146)
- . The Eight General Research Methodologies: A Facet Analysis of the Research Process. Bloomington, Indiana: Phi Delta Kappa, 1969. (ED 052 237)
- Gideonse, Hendrik D. Educational Research and Development in the United States. Washington, D.C.: National Center for Educational Research and Development, U.S. Government Printing Office, 1970.
- Griffiths, Daniel (ed.). Developing Taxonomies of Organizational Behavior in Education - Final Report. New York: New York University, April, 1968. (ED 021 339)
- . Developing Taxonomies of Organizational Behavior in Educational Administration. Chicago: Rand McNally and Company, 1969.

- Gross, N. An Attempt to Implement a Major Educational Innovation, A Sociological Inquiry. Cambridge, Massachusetts: Harvard University, 1968. (ED 032 649)
- Guba, Egon G. Methodological Strategies for Educational Change. Bethesda, Maryland: ERIC, 1965. (ED 011 404)
- _____ and William J. Gephart. Training Materials for Research, Development and Diffusion Training Programs, Final Report. Bloomington, Indiana: Indiana University, 1970. (ED 048 137)
- Haberstroh, Chadwick J. "Organizational Design and Systems Analysis," James G. March (editor), Handbook of Organizations. Chicago: Rand McNally and Company, 1965.
- Hall, A. D. and R. E. Fagen. "Definitions of System," Walter Buckley (editor), Modern Systems Research for the Behavioral Scientist. Chicago: Aldine Publishing Company, 1968.
- Halpin, Andrew W. Administrative Theory in Education. New York: The Macmillan Company, 1958.
- _____. "A Foggy View from Olympus," Journal of Educational Administration, 7:3-18, May 1969.
- _____. Theory and Research in Administration. New York: The Macmillan Company, 1966.
- Hanna, John. Project Management in an Educational Environment. Proceedings of the Project Management Institute Seminar/Symposium, St. Louis, Missouri, October, 1970.
- Hemphill, John. "Administration as Problem Solving," Andrew Halpin (editor), Administrative Theory in Education. New York: Macmillan, 1967.
- Hills, R. Jean. Toward a Science of Organization. Eugene, Oregon: University of Oregon Press, 1968.
- Jeffrey, Richard C. The Logic of Decision. New York: McGraw-Hill Book Company, 1965.
- Johnson, Richard A., Fremont E. Kast, and James E. Rosenzweig. The Theory and Management of Systems, Second Edition. New York: McGraw-Hill Book Company, 1967.
- Jones, J. Christopher. Design Methods: Seeds of Human Futures. London: Wiley-Interscience, 1970.
- Kaplan, Abraham. The Conduct of Inquiry. San Francisco: Chandler Publishing Company, 1964.
- Kast, Fremont E. and James E. Rosenzweig. Organization and Management: A Systems Approach. New York: McGraw-Hill Book Company, 1970.

- Katz, Elihu et al. "Doctor-Patient Exchanges, A Diagnostic Approach to Organizations and Professions," Human Relations, 22:309-324, August, 1969.
- Korshaw, Joseph A. and Roland N. McKean. Systems Analysis and Education. Santa Monica, California: The Rand Corporation, 1959.
- Latane, Henry A. "The Rationality in Organizational Decision-Making," Harold J. Leavitt (editor), The Social Science of Organizations. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1963.
- Lawrence, Paul R. and Jay W. Lorsch. Developing Organizations: Diagnosis and Action. Reading, Massachusetts: Addison-Wesley Publishing Company, 1969. (ED 037 620)
- LeBreton, Preston P. and Dale A. Henning. Planning Theory. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1961.
- Linville, William K. and Willis W. Harman. Systems Planning Approach to Educational Research Planning. Menlo Park, California: Stanford Research Institute, 1966. (ED 048 837)
- Lippit, Gordon L. Organizational Renewal: Achieving Viability in a Changing World. New York: Appleton-Century Crofts. (ED 037 663)
- _____. "Success is Organizational Renewal," Association Management, 22:39-41, January, 1970.
- Litterer, Joseph A. Organizations: Structure and Behavior, Volume I. New York: John Wiley and Sons, Inc., 1969.
- _____. Organizations: Systems, Control and Adaptation, Volume II. New York: John Wiley and Sons, Inc., 1969.
- Loughary, John W. et al. Man-Machine Systems in Education. New York: Harper and Row Publishers, 1966.
- March, James G. (ed.). Handbook of Organizations. Chicago: Rand McNally and Company, 1965.
- _____. and Herbert A. Simon. Organizations. New York: John Wiley and Sons, 1958.
- Marcum, R. Laverne. Organizational Climate and the Adoption of Educational Innovation. Logan, Utah: Utah State University, 1968. (ED 023 158)
- McDonough, Adrian M. and Leonard J. Garrett. Management Systems. Homewood, Illinois: Richard D. Irwin, 1965.
- Mesarovic, M. D., D. Macko, and Y. Takahara. Theory of Hierarchical, Multi-level Systems. New York: Academic Press, 1970.

- Piaget, Jean. Structuralism. New York: Harper and Row, 1970.
- Price, James L. Organizational Effectiveness: An Inventory of Propositions. Homewood, Illinois: Richard D. Irwin, Inc., 1968.
- Reynoldson, Roger L. The Interrelationships Between the Decision-Making Process and the Innovations of Public Schools, Final Report. Logan, Utah: Utah State University, 1969. (ED 035 101)
- Roberts. Understanding Research, Some Thoughts on Evaluating Completed Educational Projects. Palo Alto, California: Stanford University, 1969. (ED 032 759)
- Roman, Daniel D. Research and Development Management: The Economics and Administration of Technology. New York: Appleton-Century Crofts, 1968.
- Ronan, William W. and Erich P. Prien. Toward a Criterion Theory, A Review and Analysis of Research and Opinion. Greensboro, North Carolina: Richardson Foundation, 1966. (ED 023 166)
- Runkel, Philip J. Some Recent Ideas in Research Methodology--Facet Design and Theory of Data. Eugene, Oregon: University of Oregon, 1965. (ED 012 508)
- Shannon, C. E. "A Mathematical Theory of Communication," Bell System Technical Journal, 27:379-423, 623-656, 1948.
- _____ and W. Weaver. The Mathematical Theory of Communication. Urbana, Illinois: University of Illinois Press, 1949.
- Sieber, Sam D. and Paul F. Lazarsfeld. Reforming the University: The Role of the Research Center. New York: Columbia University, 1971. (ED 047 170)
- Stogdill, R. M. (ed.). The Process of Model Building in the Behavioral Sciences. Columbus, Ohio: The Ohio State University Press, 1970.
- USOE. Educational Research and Development in the United States. Washington, D.C.: Department of Health, Education, and Welfare, 1969. (ED 041 858)
- _____. Regional Educational Laboratories. Washington, D.C.: Office of Education (DHEW), Bureau of Research, 1968. (ED 051 134)
- Vivekananthan, P. S. The Development of a Research and Development Planning System in Education. Raleigh, North Carolina: North Carolina State University, 1971. (ED 050 430)
- Von Neumann, John. "The General and Logical Theory of Automata," Cerebral Mechanisms in Behavior. New York: John Wiley and Sons, Inc., 1951.

Von Neumann, John. "Probabilistic Logics and the Synthesis of Reliable Organisms from Unreliable Components," Automata Studies. Princeton, New Jersey: Princeton University Press, 1956.

_____ and O. Morgenstern. Theory of Games and Economic Behavior. Princeton, New Jersey: Princeton University Press, 1947.

Weiner, Norbert. Cybernetics: Communication and Control in the Animal and the Machine. New York: John Wiley and Sons, Inc., 1948.

_____. The Human Use of Human Beings: Cybernetics and Society. New York: Doubleday and Company, Inc., 1954.

Williams, J. D. The Compleat Strategyst. New York: McGraw-Hill Book Company, 1954.

Young, Stanley. Management: A Systems Analysis. Glenview, Illinois: Scott, Foresman and Company, 1966.

Zetterberg, Hans L. On Theory and Verification in Sociology. Totowa, New Jersey: Bedminster Press, 1963.

Appendix U

Educational Research and Development:
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Bibliography

BEST COPY AVAILABLE

- Ackoff, Russell Lincoln. Scientific Method: Optimizing Applied Research Decisions. New York: John Wiley and Sons, Inc., 1962.
- _____, Shiv K. Gupta, and J. Sayer Minas. Scientific Method: Optimizing Applied Research Decisions. New York: John Wiley and Sons, Inc., 1965.
- Alkin, Skager. Systems Analysis Applications in Educational Research. Los Angeles: California University, 1969. (ED 032 629)
- Anderson, Decima M. Computer Programming. New York: Appleton-Century Crofts, 1966.
- Aoki, M. Optimizations of Stochastic Systems. New York: Academic Press, 1967.
- Armitage, R., C. S. Smith, and P. Alper. Models for Educational Decision Making. London: Penguin Book Company, 1969.
- Ashby, W. R. An Introduction to Cybernetics. New York: John Wiley and Sons, Inc., 1959.
- Bartos, Otomar J. Simple Models of Group Behavior. New York: Columbia University Press, 1967.
- Beer, Stafford. Cybernetics and Management. New York: John Wiley and Sons, Inc., 1966.
- _____. Decision and Control. London: John Wiley and Sons, Inc., 1966.
- Bellman, Richard. Adaptive Control Processes. Princeton, New Jersey: Princeton University Press, 1961.
- Blackwell, David and M. A. Gershick. Theory of Games and Statistical Decisions. New York: John Wiley and Sons, Inc., 1954.
- Booth, Taylor L. Sequential Machines and Automata Theory. New York: John Wiley and Sons, Inc., 1967.
- Bowles, Samuel. Educational Production Function, Final Report. Cambridge, Massachusetts: Harvard University, 1969. (ED 037 590)
- Budd, Richard W., Robert K. Thorp, and Lewis Donohew. Content Analysis of Communications. New York: The Macmillan Company, 1967.
- Burkhead, Jesse, Thomas G. Fox, and John W. Holland. Input and Output in Large City High Schools. Syracuse: Syracuse University Press, 1967.
- Calfee, Robert C. The Role of Mathematical Models in Optimizing Instruction. Madison, Wisconsin: Wisconsin University, 1969. (ED 039 102)
- Cartwright, Desmond S. "Ecological Variables," Edgar F. Borgatta and George W. Bohrnstedt (editors), Sociological Methodology. San Francisco: Jossey-Bass, Inc., 1969.

Case, C. Marston and Stephen C. Clark. A Bibliographic Guide to Operations Analysis of Education. Washington, D.C.: National Center for Educational Statistics (DHEW), 1967. (ED 025 851)

Cattell, Raymond B. Handbook of Multivariate Experimental Psychology. Chicago: Rand McNally and Company, 1966.

. "MP and Other Coefficients of Pattern Similarity," Psychometrika, 14:279-298, 1949.

. "The Scree Test for the Number of Factors," Multivariate Behavioral Research, 1:245-276, 1966.

Chernoff, Herman and Lincoln E. Moses. Elementary Decision Theory. New York: John Wiley and Sons, Inc., 1959.

Chipman, John S. "The Foundations of Utility," R. Duncan Luce, Robert R. Bush, and Eugene Galanter (editors), Readings in Mathematical Psychology. New York: John Wiley and Sons, Inc., 1965.

Chorafas, Dimitris N. Systems and Simulation. New York: Academic Press, 1965.

Chuang, Ying C. Simulation Model and Educational Research. New York: Center for Urban Education, 1971. (ED 050 163)

Cogswell, J. F. Nova High School--System Analysis. Santa Monica, California: System Development Corporation, 1966. (ED 010 570)

and Donald G. Marsh. System Design for a Continuous Progress School--Computer Simulation of Autonomous Scheduling Procedures. Santa Monica, California: System Development Corporation, 1966. (ED 010 564)

et al. A Computer Simulation Vehicle for Educational Systems. Santa Monica, California: System Development Corporation, 1965. (ED 010 579)

. Purpose and Strategy of the School Simulation Project, Special Report. Santa Monica, California: System Development Corporation, 1963. (ED 010 560)

Cook, Desmond L. Pert Applications in Educational Planning. Columbus, Ohio: Ohio State University, 1966. (ED 019 751)

Cooper, George R. "Decision Theory," System Engineering Handbook, Robert E. Machol, et al. (editors). New York: McGraw-Hill Book Company, 1965.

Copa, George H. Identifying Inputs Toward Production Function Application in Education. Minneapolis: Minnesota Research Coordinating Unit in Occupational Education, 1971. (ED 053 317)

- Derman, Cyrus. Finite State Markovian Decision Processes. New York: Academic Press, 1970.
- Dixon, W. J. (ed.). BMD Biomedical Computer Programs X-Series Supplement. University of California Press, 1970.
- Elgerd, Olle J. Control Systems Theory. New York: McGraw-Hill Book Company, 1967.
- Fearing, Joseph L. and Gerald T. Kowitz. Some Views on Longitudinal Inquiry, Research and Services Series. Houston, Texas: Houston University, 1967. (ED 034 295)
- Fishburn, Peter C. Decision and Value Theory. New York: John Wiley and Sons, Inc., 1964.
- Flament, C. Applications of Graph Theory to Group Structure. Englewood Cliffs, New Jersey: Prentice-Hall, 1963.
- Flynn, Timothy M. Convergent-Discriminant Validation of Behavioral Ratings. February 1971. (ED 049 282)
- Fox, Karl A. and Jati K. Sengupta. "The Specification of Econometric Models for Planning Educational Systems, An Appraisal of Alternative Approaches," Kyklos, 21:665-693, 1968.
- Gordon, Robert. "Optimum Component Redundancy for Maximum System Reliability," Operations Research, 5:229-43, 1957.
- Gray, William M. and Richard J. Hofmann. Studies of Horst's Procedure for Binary Data Analysis. Albany, New York: State University of New York, 1969. (ED 046 971)
- Guertin, Wilson H. and John P. Bailey, Jr. Introduction to Modern Factor Analysis. Ann Arbor, Michigan: Edwards Brothers, Inc., 1970.
- Guttman, Louis. "An Outline of Some New Methodology for Social Research," Public Opinion Quarterly, 18:395-404, 1954.
- Hammond, Allen. Mathematical Models in Education and Training. Santa Monica, California: Rand Corporation, 1970. (ED 049 368)
- Harary, Frank. "Graph Theory and Group Structure," R. Duncan Luce, Robert R. Bush, and Eugene Galanter (editors), Readings in Mathematical Psychology, Vol. II. New York: John Wiley and Sons, Inc., 1965.
- Harman, Harry H. Modern Factor Analysis. Chicago: The University of Chicago Press, 1967.
- Hart, John F. and Satoru Takasu. Systems and Computer Science. Ontario: University of Toronto Press, 1967.

- Hofstaetter, Peter A. "Your City--Revisited, A Factorial Study of Cultural Patterns," American Catholic Sociological Review, XIII, October, 1952.
- Holtman, A. G. "Linear Programming and the Value of an Input to a Local Public School System," Public Finance, 23:429-440, 1968.
- Horn, J. L. "Significance Tests for Use with r_p and Related Profile Statistics," Educational Psychological Measurement, 21:363-370, 1961.
- Horst, Paul. "An Overview of the Essentials of Multivariate Analysis Methods," Handbook of Multivariate Experimental Psychology, Raymond B. Cattell (editor). Chicago: Rand McNally and Company, 1966.
- Kemeny, John G. et al. Finite Mathematics with Business Applications. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962.
- Kenney, Martin G., Herman E. Koenig, and Rita Zemach. "State-Space Models of Educational Institutions." Paper presented at a meeting of Ad Hoc Group on Efficiency in Resource Utilization in Education, OECD, Paris, January, 1967.
- Lazarsfeld, Paul F. "Latent Structure Analysis and Test Theory," Paul F. Lazarsfeld and Neil W. Henry (editors), Readings in Mathematical Social Science. Chicago: Science Research Associates, Inc., 1966.
- _____ and Neil W. Henry. "The Application of Latent Structure Analysis to Quantitative Ecological Data," Fred Massarik and Philburn Ratoosh (editors), Mathematical Explorations in Behavioral Science. Homewood, Illinois: Richard D. Irwin, Inc., 1965.
- Levine, Gustav and Cletus J. Burke. Mathematical Model Techniques for Learning Theories. New York: Academic Press, 1972.
- Luce, R. D. Games and Decisions. New York: John Wiley and Sons, Inc., 1957.
- _____. Individual Choice Behavior. New York: John Wiley and Sons, Inc., 1959.
- Maccia, E. S. "The Model in Theorizing and Research." Occasional paper 65-180. Columbus: Bureau of Educational Research and Service, The Ohio State University, 1965.
- Martin, Francis P. Computer Modeling and Simulation. New York: John Wiley and Sons, Inc., 1968.
- McGaw, Barry and Karl G. Joreskog. Factorial Invariance of Ability Measures in Groups Differing in Intelligence and Socioeconomic Status. Princeton, New Jersey: Educational Testing Service, 1970. (ED 053 156)
- McMillan, Claude and Richard F. Gonzalez. Systems Analysis: A Computer Approach to Decision Models. Homewood, Illinois: Richard D. Irwin, 1968.

- McNamara, James F. "Mathematical Programming Models in Educational Planning," Review of Educational Research, 41(5):419-446, December, 1971.
- McReynolds, William Peter. A Mathematical Model for an Educational System. Ontario: The Ontario Institute for Studies in Education, 1971.
- Meredith, William. "Rotation to Achieve Factorial Invariance," Psychometrika, 1964.
- Mesarovic, M. D., D. Macko, and Y. Takahara. Theory of Hierarchical, Multi-level Systems. New York: Academic Press, 1970.
- Miernyk, William H. Input-Output Analysis. New York: Random House, 1966.
- Miller, Donald M. et al. Multivariate Procedures for Stratifying School Districts, Final Report. Madison, Wisconsin: Wisconsin State Department of Public Instruction, 1967. (ED 012 370)
- Mishkin, Eli and Ludwig Braun. Adaptive Control System. New York: McGraw-Hill Book Company, Inc., 1961.
- Murray, James R. and David E. Wiley. New Statistical Techniques for Evaluating Longitudinal Models. Chicago: University of Chicago, 1970. (ED 045 709)
- Naylor, Thomas H. et al. Computer Simulation Techniques. New York: John Wiley and Sons, Inc., 1966.
- Nesselroade, John R. and Paul B. Bates. "On a Dilemma of Comparative Factor Analysis: A Study of Factor Matching Based On Random Data," Educational and Psychological Measurement, Winter, 1970.
- Nilsson, Nils J. Learning Machines: Foundations of Trainable Pattern-Classifying Systems. New York: McGraw-Hill Book Company, 1965.
- Organization for Economic Cooperation and Development. Econometric Models of Education: Some Applications. Paris: OECD, 1965.
- . Mathematics Models in Educational Planning. Paris: OECD, 1967.
- Ogata, Katsuhiko. State Space Analysis of Control System. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1967.
- Pfanzagl, Johann. "A General Theory of Measurement--Applications to Utility," R. Duncan Luce, Robert R. Bush, and Eugene Galanter (editors), Readings in Mathematical Psychology. New York: John Wiley and Sons, Inc., 1965.
- Pontryagin, L. S. et al. The Mathematical Theory of Optimal Processes. New York: John Wiley and Sons, Inc., 1962.

- Popham, W. James (ed.). Criterion-Referenced Measurement, An Introduction. Englewood Cliffs, New Jersey: Educational Technology Publications, 1971.
- Raiffa, Howard and Robert Schlaifer. Applied Statistical Decision Theory. Boston: Harvard University Graduate School of Business Administration, 1961.
- Rapaport, Anatol. "Mathematical Models of Social Interaction," R. Duncan Luce, Robert R. Bush, and Eugene Galanter (editors). Handbook of Mathematical Psychology. New York: John Wiley and Sons, Inc., 1963.
- Restle, F. "The Relevance of Mathematical Models for Education," National Society for the Study of Education, 63rd Yearbook. Chicago: National Society for the Study of Education, 1964.
- Roe, A. An Adaptive Decision Structure for Educational Systems. Berkeley: University of California, 1963.
- Runkel, Philip J. Some Recent Ideas in Research Methodology: Facet Design and Theory of Data. Eugene, Oregon: CASEA, University of Oregon, 1965.
- Sawaragi, Y., Y. Sunahara, and T. Nakamizo. Statistical Decision Theory in Adaptive Control Systems. New York: Academic Press, 1967.
- Schultz, Donald G. and James L. Melsa. State Functions and Linear Control Systems. New York: McGraw-Hill Book Company, 1967.
- Sebestyen, George S. Decision-Making Processes in Pattern Recognition. New York: The Macmillan Company, 1962.
- Shavelson, Richard J. The Theory of Directed Graphs: Some Applications to Research on Teaching. Stanford: Stanford University, 1971.
(ED 049 192)
- Shelly, Maynard W. "A Topological Approach to the Measurement of Social Phenomena," Joan Criswell, Herbert Solomon, and Patrick Suppes (editors), Mathematical Methods in Small Group Processes. Stanford, California: Stanford University Press, 1962.
- Shina, Bani K. et al. "Toward Aggregate Models of Educational Systems," Socioeconomic Planning Sciences, 3:25-36, 1969.
- Shinners, Stanley M. Techniques of System Engineering. New York: McGraw-Hill Book Company, 1967.
- Sisson, Roger L. Some Results of a Simulation of an Urban School District. Philadelphia: University of Pennsylvania, 1967. (ED 012 096)
- Starbuck, William H. "Mathematics and Organization Theory," James G. March (editor), Handbook of Organizations. Chicago: Rand McNally and Company, 1965.

- Stevens, S. S. "Measurement, Psychophysics, and Utility," C. W. Churchman and P. Ratoosh (editors), Measurement: Definitions and Theories. New York: John Wiley and Sons, Inc., 1959.
- Stone, Richard. "A Model of the Educational System," Minerva, 1965.
- Suppes, Patrick. Measurement, Problems of Theory and Application. Stanford: Stanford University, 1969. (ED 036 425)
- Tatsuoka, Maurice M. Discriminant Analysis: The Study of Group Differences. Champaign, Illinois: Institute for Personality and Ability Testing, 1970.
- Thrall, Robert M. "Game Theory," Robert E. Machol et al. (editors), System Engineering Handbook. New York: McGraw-Hill Book Company, 1965.
- Timothy, Lemar K. and Blair E. Bona. State Space Analysis. New York: McGraw-Hill Book Company, 1968.
- Tinbergen, Jan and H. C. Bos. Econometric Models of Education: Some Applications. Paris: OECD, 1965.
- Tracz, George S. "An Overview of Optimal Control Theory Applied to Educational Planning." Paper read at the American Educational Research Association, Los Angeles, California, 1969.
- Walker, Jerry P. Decision-Making Under Conditions of Information Overload: Alternative Response Modes and Their Consequences. Bethesda, Maryland: ERIC, 1971. (ED 049 518)
- Weiss, Lionel. Statistical Decision Theory. New York: McGraw-Hill Book Company, Inc., 1961.
- Welty, Gordon and Alfred Berardino. Structural Models and Dynamic Organizational Research, A Possibility Theorem, 1970. (ED 039 646)
- Werts, Charles E. A Multitrait-Multimethod Model for Studying Growth. Princeton, New Jersey: Educational Testing Service, March 1971.
- Whittemore, Bruce. An Example of the Application of Generalized Information Systems Concepts to the Quantification of Information in a Decision System. Columbus: Ohio State University, 1971. (ED 053 751)