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## A Systemic Analysis of Unit Teaching

The quest for symmetry seems a very persistent human preoccupation. Man has ever been a system-building animal in response to the chaos and disorder with which nature seems to have confronted him. This tendency has assisted him to adapt to and subsequently exercise some control over his environment. A product of this tendency has been a symbolic treasure house of past experiences and some very instrumental conceptual schemes which have enabled man to construct ever more sophisticated systems.

The terms *systems* and *systems analysis* have of late become quite fashionable. The development of technologically complex military systems from the radar system in World War II to the elaborate missile and air-defense systems of today are largely responsible for this vogue. As a consequence of these military systems and of industrial automation several new disciplines have emerged including systems engineering, operations research, human engineering and psychotechnology. On a more abstract level, a number of academic theorists, notably L. von Bertalanfy and Kenneth E. Boulding, have been attempting to develop a *general systems theory* which would encompass all levels of systems. In the social sciences, Talcott Parsons of Harvard has been working for some years to develop a general *social systems theory* which would integrate the major concepts of all the social sciences into a single conceptual framework. To date, education has not been very much influenced by these developments except for some interest shown by theorists in administration.

Our purpose in this paper is to attempt to utilize the systems frame of reference in analyzing a curriculum component — the teaching unit. It is an axiom of systems theory that components of systems are also systems. As a gross tentative definition of system, the following seems adequate:

The concept of systems . . . implies a *goal* or *purpose*, and it implies *interaction* and *communication* between components or parts.<sup>1</sup>

For our purposes it is unnecessary to define the curriculum system. A body of graded content has been arrived at through consultations be-

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<sup>1</sup>John L. Kennedy, "Psychology and System Development," in R. M. Gagne (ed.), *Psychological Principles in Systems Development* (New York: Rinehart & Winston, 1962), p. 15.

tween sociological weathermen who have interpreted the climate of opinion and educational experts who have interpreted the child; these findings in turn have been added to historical accretions and printed by state or provincial educational departments as official curriculum guides. This content is taken by persons designated as teachers, whose task it is to facilitate its communication to a particular age-grade group of children.

A case can be made on psychological, logical and instrumental grounds for subdividing the curriculum system. Psychological research seems to have demonstrated that the human penchant for pattern is such that even where none exists it is often perceived. In addition, Piaget's concept of the concrete stage and related work in the temporal-spatial conceptions of children implies the existence of limits on the scope and sequence of the elementary curriculum. If the curricular system is to be psychologically sound, it would appear that it needs to be manifestly patterned, and for young children, organized in terms of short foreseeable goals. If the concept of structure is a valid one then it follows that the respective disciplines consist of interrelated components — in short, they are systems and can consequently be studied in parts. Finally, it has been a postulate of scientific administration that the more specific or limited the task, the more efficient the operation. Reinforcement psychologists seem to hold a similar view.

It is not contended that these theories were considered in the genesis of the unit system. On the contrary, it is more likely that the unit evolved as a pragmatic adaptation of classroom teachers to the limitations of the learner. The purpose of this paper, however, is not to provide a rationale for the unit but to analyse it as an existing sub-system within the curriculum.

The North American teacher plays relatively little part in the design of the total curriculum system. It is the teacher's task to take the given unit topics, arrange their sequence (if this is not prescribed) and implement them in the ongoing classroom situation. At the unit level the teacher's freedom to decide and exercise creativity is considerable.

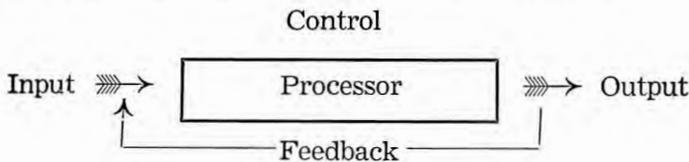
The initial definition of system can be elaborated at this point. According to Optner<sup>2</sup>, the most elementary systems contain five properties:

1. a set of *inputs*
2. a set of *outputs*
3. a *processor* which converts 1 to 2
4. *controls* which monitor the processor so that it will operate in a prescribed way
5. a *feedback* which monitors output back to input to correct subsequent output

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<sup>2</sup>Stanford L. Optner, *Systems Analysis for Business Management* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1960), p.9.

Optner<sup>3</sup> diagrams this basic system module as follows:



Converting this schema into unit terminology, the terms would have the following referents:

1. Inputs would mean pupils and content (including resource materials).
2. Outputs would mean altered pupils who have integrated and internalized the content.
3. The processor would consist of three forms of interaction:
  - (a) pupils and content mediated by the teacher,
  - (b) pupils and content mediated by secondary and/or primary resources (i.e., films, books, resource persons, etc.),
  - (c) some pupils and content mediated by other pupils.
4. Controls monitoring the processor would be the teacher.
5. Feedback would consist of concurrent evaluation procedures.

This elemental module provides some taxonomic assistance in unit analysis but is still too simple to be very useful. Reviewing the literature on unit planning and organization there seems to be agreement that the unit proceeds in stages and involves preplanning by the teacher, an initiating activity, research, reporting, evaluation, and a culminating activity. With some terminological liberties, the following seems to be a model of the unit process:

1. Pre-operational organization (by teacher)
  - (a) content selection
  - (b) resource evaluation and collection
  - (c) division of labor outline (preliminary)
2. Operational stage
  - (a) initiation or triggering of unit
  - (b) pupil-content interaction to acquire background — partially random
  - (c) division of labor (final)
  - (d) pupil-content interaction — purposive
  - (e) subgroup outputs
  - (f) integration of subgroup outputs

<sup>3</sup>*Ibid.*, p. 11.

- (g) evaluation of whole-unit output
- (h) expressive or symbolic completion

In the pre-operational stage the teacher, if he has the option, selects a unit from the official curriculum, gathers and evaluates resources (i.e., books, films, pictures, maps, resource persons, field trip prospects, etc.) and organizes the content topic in terms of sub-topics and topic problems. There is an arbitrary element in these decisions but perhaps an illustration will add some clarity. Let us take a sixth grade unit on the Middle Ages. It is possible to divide this unit in many ways — salient topics which immediately occur to one might include some of the representative institutions such as knighthood, the guilds, the church and the manorial system. These can be designated as *sub-topics* to be assigned to classroom groups. The universe of *topic problems* is likewise large. The hierarchical nature of medieval institutions suggests the topic of structure or organization — for example the group studying knighthood could develop the various gradations of the institution such as page — squire — knight; and the group studying guilds could go through the apprentice-journeyman-master craftsman stages. Another major problem likely to be raised by the children themselves might include the functions or adaptations of each of the salient institutions (i.e., agriculture, defence, cultural preservation, etc.). Finally, some examination of culture products of the period such as the stories of King Arthur or Roland, the gothic cathedrals, tapestries, etc. might serve as a third topic area.

## SUB-TOPICS

<i>Topic Problem Organization</i>	Knighthood	The Guilds	The Church	The Manorial System
(a)				
(b)				
(c)				
Functions				
(a)				
(b)				
(c)				
Culture				
(a)				
(b)				
(c)				

Completion of the tasks of unit selection, resource inventory and collection, and the division of labor outline, permits commencement of the unit proper.

Some initiating experience introduces the operational stage of the unit system. This can be some content-related resource such as a film, resource person, or even in rare instances a fortuitous event which arouses high content motivation and is educationally relevant. This is followed by a state of pupil-content interaction — perhaps random in part — for the purpose of acquiring sufficient information to participate in decision-making regarding the division of labor. The pre-operational outline can be modified as a result of teacher-pupil discussions. A consequence of these discussions is the subdivision of the class according to sub-topics and a division of the groups according to topic problems (i.e., individual assignments). This is followed by a period of purposive research in which perhaps all three forms of pupil-content interaction are utilized. Completion of assignments is followed by sub-topical reports (outputs) which are integrated by the teacher for each sub-topic and again for the whole unit. Concurrent evaluation is going on at all stages and levels. General evaluation takes place following output consolidation. A ritualized stage symbolizing completion of the unit called the “culminating activity” is usually added to provide opportunities for expressive consolidation of the content (i.e., plays, dances, models, etc.). Preparation for this activity functions to provide for variation of routines and alternative activities for subgroups completing their tasks.

Among recent techniques for diagramming projects, PERT<sup>4</sup> (Program Evaluation and Review Technique) has gained wide acceptance and demonstrated effectiveness. An elaborate description is not appropriate at this time; however, in view of its usage in this article, some clarification of symbols would be helpful:

Rectangles and squares represent *events* started or completed.

Lines represent *activities*.

“S” stands for events started.

“C” stands for events completed.

There are other conventions and more involved procedures for time estimates, which for the sake of simplicity will be omitted from this network.

The PERT network included in this paper has a number of advantages over previous unit diagrams. It shows the concurrency of evaluation and skill development; it takes into account the staggered completion times of group tasks; it seems to include most of the relevant variables in unit organization; it is an attempt to gain greater precision in conceptual identification and definition; finally, it includes the optional utility of time allocation in a more specific fashion.

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<sup>4</sup>A very useful elementary introduction to this technique is contained in Harry F. Evart, *Introduction to PERT* (Boston: Allyn & Bacon Inc., 1964).

