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ABSTRACT

In this paper, the SIGGS Theory is set forth and shown to be a model for educational research. The paper treats of the SIGGS Theory, educational research, and of the SIGGS Theory as a model for educational research. The SIGGS Theory provides characterizations of a general system beyond those developed prior to SIGGS' introduction. "SIGGS" indicates that these additional characterizations arise from the incorporation of set theory (S), information theory (I), and graph theory (G) into general systems theory (GS). Educational research is analyzed to be theoretical, qualitative, and performative. Moreover, theoretical research is found to be nonempirical (philosophical) as well as empirical (scientific and praxiological), and to operate by the rules of retroduction and deduction to produce theory about the teaching-learning process as well as by the rules of induction to relate such theory to teaching-learning states of affairs. SIGGS is shown to be a model for educational research, for through it the kinds of elements in the teaching-learning process and their relations could be set forth. Information theoretic notions provide a framework for categorizing the elements, and, along with graph theory, their interactive aspects. (Author)

ON A MODEL FOR EDUCATIONAL RESEARCH: EXTENDED SYSTEMS THEORY (SIGGS)

by

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Errata to: ON A MODEL FOR EDUCATIONAL RESEARCH:
EXTENDED SYSTEMS THEORY (SIGGS)

p. 11, l. 25: 'of a' not 'of the'

p. 4, l. 12: 'affect' not 'affected'

p. 6, l. 6: 'E. S. Maccia has' not 'I have'

p. 8, l. 6: 'praxiological)' not 'praxiological)'

p. 12, l. 25: 'instance' not 'instances'
l. 27: 'interpreted' not 'given meaning'

p. 13, l. 12: 'inner city' not 'ghetto'
l. 13: 'inner city' not 'ghetto'
l. 16: 'of other' not 'of the'

p. 14, l. 15: 'SIGGS'' not 'SIGGS'
l. 26: 'presented' not 'set forth'

p. 15, l. 14: 'such' not 'heuristic'

p. 25, no. 19, l. 2: 'inner city' not 'ghetto'

INTRODUCTION

In this paper we shall set forth the SIGGS Theory and show how it is a model for educational research. The paper, therefore, is divided into three parts: the first which treats of the SIGGS Theory, the second of educational research, and the third of SIGGS Theory as a model for educational research.

SIGGS THEORY[1]

The SIGGS Theory is an extension of general systems[2] theory. General systems theory was proposed by Ludwig von Bertalanffy[3] and is a set of principles applying to any system whether it be physical, biological, or human. The theory is based upon assumptions of non-linearity and complex interactions among the parts which make up the system. Thus, there is a centering on the behavior of the system as a whole and characterizations are not of units one at a time. SIGGS Theory provides characterizations of a general system beyond those developed prior to SIGGS' introduction. 'SIGGS' indicates that these additional characterizations arise from the incorporation of set theory (S), information theory (I), and graph theory (G) into general systems theory (GS). Also, through the use of the logico-mathematical sophistication of these incorporated theories, greater precision is given to the characterization of a general system.

Set theory gives meaning to a system as a group of components with connections between them. A system is taken to be a group of at least two components with at least one affect relation and with information. Utilizing set theory, the group of at least two components becomes a set of at least two elements which form a sequence. The conditions, too, are given meaning ultimately in terms of set theory. A relation between components of the system, an affect relation, is given meaning through digraph theory which is based upon set theory. Through digraph theory, the group of a system

becomes a set of points and an affect relation a set of directed lines. Not only is set used, but also the set theoretic definition of 'function'. An affect relation is a mapping of the group into itself. Through information theory, information of a system becomes a characterization of system occurrences at categories in a classification. System occurrences may be with respect to either system components or system affect relations or both. Since a classification is a set of categories, set theory also is basic to information theory.

Properties of a system are not part of the definition of 'a system'. Rather properties are subsets of systems which are sorted out from the set of all systems, because they have conditions on them over and above the conditions which make them a system. Explicit use of set theory is exemplified in the conditions with regard to size and sameness. In the former the set theoretic characterization, cardinality, is explicit, while in the latter, homomorphic or isomorphic or automorphic mapping is.

The set characterization, complement, marks off the system from its surroundings, the negasystem. Within whatever universe of discourse is selected, the components selected for consideration, the components which do not belong to the system are the negasystem. See Figure 1.

Information theory gives meaning to the categorization of the components and connections of a system and its negasystem. Every system has information in the sense that occurrences of its components or affect relations or both can be classified according to categories. The added condition of selectivity of the information, i.e. uncertainty of occurrences at the categories, is required to develop information properties of systems and negasystems and of their states. Figure 1 summarizes and illustrates the basic information properties of a system (toputness, inputness, storeputness, feedinness,

feedoutness, feedthroughness, and feedbackness) and of a negasystem (fromputness and outputness).

Only the condition of selectivity is required to give meaning to toputness, inputness, fromputness, and outputness. Both toputness and outputness involve selective information on a negasystem, whereas fromputness and inputness involve selective information on a system. Nevertheless, toputness can be sorted out from outputness, and fromputness from inputness. Toputness is a system property, a system's environment or the selective information on a negasystem available to a system, but outputness is a negasystem property, its selective information. Likewise, fromputness is a negasystem property, a negasystem's environment or the selective information available to a negasystem, but inputness is a system's property, its selective information.

The other basic information properties require conditions over and above that of selectivity. Storeputness requires the selective information to be conditional, since storeputness is system selective information which results when one takes into account the dependency of system selective information upon that available to a negasystem. Feedinness, feedoutness, feedthroughness, and feedbackness are properties in which there is a flow of selective information, a transmission of selective information. Conditions, hence, of selective information separated by time intervals and sharing of selective information are requirements. To illustrate: feedinness is shared information between toputness and inputness, where toputness is at a time just prior to the inputness.

Graph theory gives meaning to the kinds of connections between components. Through digraph theory a system group becomes a set of points and system affect relations become sets of directed lines, and digraph properties of a system result when certain conditions are placed on its affect relations or its group.

Complete connectionness, strongness, unilateralness, weakness, and disconnectionness illustrate digraph properties of a system arising from conditions on its affect relations. Complete connectionness is a property in which affect relations are direct directed ones and in which every two components are contained; there are direct channels back and forth between every two components. In strong systems the affect relations are directed ones and every two components are contained in them; there are channels back and forth between every two components but they are not direct. Although in unilateral systems affect relations are directed and every two components are contained in them, the channels are only one-way. In weak systems there are no channels, since directions are not specified. Weak systems nevertheless have every two components contained in the affected relations, a condition lacking in disconnected ones.

Passive dependentness, active dependentness, independentness, and interdependentness exemplify digraph properties of a system due to conditions on the group. The conditions on the group have to do with the group component containment in affect relations. In passive dependentness, components are so contained that channels only go to the components; in active dependentness, channels only go from them; in independentness, channels do not go either to or from them; and, finally, in interdependentness channels go to and from them.

To summarize: SIGGS Theory consists of a group of related terms which are descriptive of any system. These terms are set forth in Tables 1 and 2. Some of the terms are primitive or undefined and others defined. Because the defined terms are reducible to the undefined ones, they are interrelated. Moreover, some terms directly characterize systems, e.g. adaptiveness which is a property of a system, while others do not, e.g. output of a system

which is a property of the negasystem (surroundings of a system) since it is the negasystem's information whose original source is the system.

EDUCATIONAL RESEARCH

There are prevalent confusions about research, although it usually is taken to be disciplined inquiry whose function is knowledge production. That is to say, there is agreement that research is rule-governed seeking of answers to questions so that the answers are adequate renditions of states of affairs, but confusion arises as to what is encompassed by the terms 'knowledge' and 'states of affairs' and what are the rules to be followed.

'Knowledge' is usually taken only in the sense of knowledge of that, the usual propositional knowledge we all recognize. An instance would be knowledge that verbal responses can be taught through differential reinforcement of successively more effective approximations (Skinner). Knowledge of that one and knowledge of how are overlooked. Knowledge of that one or of a unique thing is best exemplified in art appreciation where one comes to apprehend embodied meaning. An instance would be war, death, and destruction as felt quality of the organized broken planes, jagged edges, and blacks and whites which is Guernica. Besides this qualitative knowledge, there is performative knowledge or knowledge of how. The know how of Picasso as he worked with canvas and pigment to produce Guernica is an illustration. The neglect of qualitative knowledge and performative knowledge has largely limited research to the propositional or theoretical. But surely one can engage in disciplined inquiry with respect to that one (so the appreciator does or should) and with respect to how (so the performer does or should). Research, therefore, can be productive of three kinds of knowledge: theoretical, qualitative, performative and so is of three respective kinds.

Another confusion arises because states of affairs are taken empirically. Although 'empirical' simply designates experiential, to be experienced is taken in the narrow sense of to be observed. Thus, propositions about what is desirable inherently or in itself are ruled out. What is or has been can be observed as can be what is desirable relative to something else. Science and technology (or what I have come to call 'praxiology'[4]) are possible on this empirical view[5] of states of affairs. Philosophy is not. But surely one can engage in disciplined inquiry about ideal states of affairs. One has but to recall Plato's Republic which is a treatise on the ideal man and the ideal society or state. Plato treats not of what is desirable relative to something else but of what is desirable in and of itself. Moreover, as his words make clear, he is not describing what is or necessarily will be:

> "Well," said I, "in heaven, perhaps a pattern of it is indeed laid up, for him that has eyes to see, and seeing to settle himself therein. It matters nothing whether it exists anywhere or shall exist; for he would practice the principles of this city only, no other."[6]

Theoretical research, therefore, is of three kinds: scientific, praxiological, and philosophical. Figure 2 summarizes the kinds of research and the kinds of theoretical research.

The final confusion to be considered is also about theoretical research. Theoretical research is not only taken in simply an empirical sense, which has been shown above to be a mistake, but also its rules are limited to those of collecting and interpreting data. To state the matter differently, statistics and design are emphasized and concept and theory formation are neglected. This neglect arises from taking induction in a Baconian sense or by holding a narrow inductivist's view of research. The theoretical knowledge the researcher is after is taken to arise simply from the data (from states

of affairs). But clearly this will not do. One must bring theory to states of affairs in order to direct one's research. As Hempel stated the matter:

> Let us just note that an inquiry conforming to this idea /the narrow inductivist's view of research/ would never go beyond the first stage /stage of observing and recording facts/, for--presumably to safeguard scientific objectivity--no initial hypotheses about the mutual relevance and interconnections of facts are to be entertained in this stage, and as a result, there would be no criteria for the selection of the facts to be recorded. The initial stage would therefore degenerate into an indiscriminate and interminable gathering of data from an unlimited range of observable facts, and the inquiry would be totally without aim or direction.[7]

It is retroduction, not induction, which is the source of theory. Peirce introduced the concept of retroduction:

> The inquiry begins with pondering these phenomena in all their aspects, in the search of some point of view whence the wonder shall be resolved. At length a conjecture arises that furnishes a possible explanation by which I mean a syllogism exhibiting the surprising fact as necessarily consequent upon the circumstances of its occurrence together with the truth of the credible conjecture as premises. . . . The whole series of mental performances between the notice of the wonderful phenomenon and the acceptance of the hypothesis . . . I reckon as comprising the First Stage of Inquiry. Its characteristic formula of reasoning I term Retroduction.[8]

The theory models approach[9] emerges when one notices that theoreticians find their point of view in theory that has worked with other states of affairs. Theory provides models for theorizing. The theory models approach is schematized in Figure 3. This approach is neither reductive nor deductive, for the theory is neither the same as nor implied by the other theory.

Although induction is not the source of theoretical knowledge and retroduction which is is not deductive, yet induction and deduction also are important to the theoretical research process. Induction is the logic of verification, of design and statistics, while deduction along with retroduction is the logic of theory formation. Deduction permits the derivation of ideas through implication. Thus all three logical modes--induction, deduction,

and retroduction--furnish the rules of theoretical research.

To summarize: research cannot be limited to the theoretical nor can theoretical research be limited to the empirical nor can empirical theoretical research operate simply by the rules of induction. Rather research is of three kinds--theoretical, qualitative, and performative--and theoretical research is empirical (scientific or praxiological) as well as non-empirical (philosophical), and theoretical research must operate by the rules of retroduction and deduction to produce theory and by induction to relate theory to states of affairs.

Now that the prevalent confusions about research have been sorted away those about education must be too. Even though we are clear about research, we must likewise be clear about education or educational research will remain ambiguous.

Frankena has pointed out four senses of 'education':

> (1) the activity of educating carried on by teachers, schools, and parents (or by oneself),
>
> (2) the process of being educated (or learning) which goes on in the pupil or child,
>
> (3) the result, actual or intended, of (1) and (2),
>
> (4) the discipline or field of inquiry that studies or reflects on (1), (2), and (3) and is taught in schools of education.[10]

He concludes that 'education' in sense 1 is the formation through instruction of desirable dispositions or excellences, in sense 2 the acquisition through learning of desirable dispositions or excellences, in sense 3 the possession of desirable dispositions and excellences, and in sense 4 the study of education in the other three senses.[11] Although he does not indicate such, it is obvious that senses 2 and 3 are a part of 1. Formation is through learning and involves acquisition. It is obvious also that Frankena's sense 1 is of good (desirable) education and so the study of education is limited to that of good education.

E. S. Maccia has considered seven senses of 'education': development, learning, training, instruction, good education, schooling, and subject matter.[12] Training, instruction, good education, and schooling are too exclusive; 'education' is taken in too narrow a sense. Training involves direct learning, while instruction involves indirect learning, e.g. learning mediated through symbols. Since training concentrates on the kind of learning human beings have in common with infra-animals, no wonder human education is often equated (as Frankena does) with instruction which emphasizes the kind of learning unique to supra-animals. Both training and instruction, however, constitute education. It is patent that one can be educated badly; one's learning need not be desirable from the standpoint of what is achieved. Thus, good education, Frankena's sense of 'education', is too limiting. Finally, the school is only one of many possible educational arrangements; there are alternatives to schooling.

'Education' too can be taken in too broad a sense. Development and learning are two such inclusive senses. As development, education becomes as broad as life. As learning, education becomes not quite as broad as life, for all development cannot be attributed to learning, e.g. growing in physical size. But, as learning, education includes too much. Learning can occur without teaching.

To avoid taking too little or too much as education, education should be taken as a teaching-learning process. To be a teaching-learning process is to be one in which somebody teaches something to somebody somewhere. Teacher, curriculum, learner, and setting would be included then in education. The setting could be more than physical; it could include persons such as administrators, counselors, and custodians.

Table 3[13] summarizes that neither teaching nor learning need be achieved to have education. Effective education, however, would demand the achievement of both. It should be noted too that achievement is not possible without the task, and that the goodness (other than in an instrumental sense which is effectiveness) is a question beyond effectiveness. One can be effectively badly educated.

One sense of 'education', education as study of teaching-learning, still remains. This is Frankena's sense 4, but not taken here in this limited sense of the study of good education. Rather 'education' in the sense of discipline is the result of studying the teaching-learning process. In order to avoid confusion between the object of study and the study, E. S. Maccia has introduced 'educology'[14] to stand for the latter. 'Education' is retained for the teaching-learning process.

Based upon the above analyses, educational research is rule-governed inquiry into the teaching-learning process in order to produce the discipline of educology, i.e. to produce knowledge about education. E. S. Maccia has overlooked knowledge of that one and knowledge of how and so has equated educology with propositional or theoretical knowledge. Thus, educology for her had three branches: science of education, praxiology of education, and philosophy of education.[15] Although recognizing this limitation, this paper will be directed to educational research that has as its outcome theoretical knowledge.

What the educational researcher seeks if he is attempting to obtain theoretical knowledge is a description[16] of education. This description can be either of education or effective education or good education. Consequently, theoretical educology (E^T) consists of science of education (S^e), praxiology

of education (P^e), and philosophy of education (Ph^e):

$$E^T = S^e \cup P^e \cup Ph^e$$

Another limitation of this paper is thatit will be directed toward scientific educational research, i.e. research resulting in S^e.

A systematic description of education consists in categorizing its components and the connections between its components. The four major components of education (e), the teaching-learning process, are teacher (t), curriculum (c), learner (l), and setting (s):

$$e = t \cup c \cup l \cup s$$

The categories characterizing each of these major components must be set forth:

$$t = t_1 \cup \ldots \cup t_n$$

$$c = c_1 \cup \ldots \cup c_n$$

$$l = l_1 \cup \ldots \cup l_n$$

$$s = s_1 \cup \ldots \cup s_n$$

Then the connections must be set forth. For instance with respect to learner components, the affect of one learner component upon another

$$l_i \longrightarrow^{17} l_j$$

and the affect of teacher components, curriculum components, and setting components upon learner components

$$t_j \longrightarrow l_j$$

$$c_j \longrightarrow l_j$$

$$s_j \longrightarrow l_j$$

Of necessity, sophisticated description proceeds to a level of combined components

$$l_i \wedge t_j \longrightarrow l_j \quad .$$

SIGGS AS MODEL

SIGGS was used as a model for an educational theory about schools.[18] In this development, the defining characteristics of any system which were set forth in SIGGS were given meaning in terms of a school. More specifically, kinds of school components, affect relations, and information were set forth. Since the school is a human system, its components are those characteristic of any human system, i.e. persons, things, and symbolic characterizations. The affect relations of a school from the standpoint of the affector therein are instructional, inquiry, governing, and facilitating, while those from the standpoint of the affectee are referent, expert, legitimate, reward, and punishment. To illustrate how affector and affectee affect relations interrelate, consider the affector role of governing and the affectee role of reward. The affector role of governing determines a relationship between an educational leader and an educational administrator which establishes a path of communication, while the affectee role of expecting reward establishes a path for influence of the leader over the administrator. The kinds of information are simply iterations of the kinds of components and affect relations.

The next step in the development was to give meaning to the properties of systems in terms of a school. For instance, centralness, CE, a graph theoretic property of any system which designates concentration of channels, was given meaning in a school in terms of concentration of relations between components of a school. When a school has much centralness, there is much centralization in its organization, e.g. many persons of a school have no lines of communication while a few have many. Another instances of a property given meaning in terms of the school is the graph information theoretic property of toputness, TP, which is given meaning as school demand. Toputness is the

selective information on the negasystem, i.e. the environment of a system. In the context of a school, toputness becomes the environment of a school and so the demands placed upon it.

To complete the development, relations between the properties of a school were stated. Two hundred and one such relatings, i.e. hypotheses about a school, were devised. $CE\uparrow \longrightarrow TP\downarrow$ is one of the hypotheses and expresses the proposition that as the centralization of a school increases the environment of a school becomes constricted or the demand placed upon a school decreases.

The above hypothesis and other hypotheses that include the property of centralization were utilized to explain aspects of the Ocean-Hill Brownsville Case.[19] One could explain why the needs of the ghetto could not be met in terms of the centralization of the school system.[20] The ghetto could not place its demands upon the school system, because there were few lines of communication from the Ocean-Brownsville District. As the centralization increased, the demands decreased. Examples of the hypotheses utilized to explain the case were:

$$CE\uparrow \longrightarrow IM\uparrow$$

$$CE\uparrow \wedge \underline{SE} \longrightarrow SB\downarrow$$

$$\overline{CE} \longrightarrow I\uparrow$$

'IM' stands for sameness which is isomorphic in quality. Centralization in a school system when it increases leads to a decrease in the expression within the system and hence to standardization. Thus, the city-wide reading lists in the New York School System were explained. 'SE' stands for stress on the school system. When centralization increases and the stress is above a certain value what happens is a decrease in stability. The anger of the black communities which became lockouts and boycotts points to the great stress or crisis facing the schools of New York City. No wonder the system became

increasingly unstable. Finally 'I' stands for lack of paths of influence, independence. Clearly, if the centralization is below a certain value, then independence occurs. Independence in turn leads to stability being below a certain value ($I\uparrow \longrightarrow \overline{SB}$). New York's children being locked out of their schools three times by the strikers attests to not enough stability in their schools. Incidentally, this explanation by means of the SIGGS Educational Theory also points to a way of controlling the school system in order to serve the people. The way is to control centralization; too much or too little is not wanted.

A further development with respect to SIGGS was to use it as a model for a theory of education whether it be schooling or not. The beginning of this development is recorded in our paper presented last summer at Oxford.[21] In that paper the four major components of education are taken as subsystems: teacher, curriculum, learner, and setting. See Figure 4. This taking of subsystems depends upon utilization of SIGGS set theoretic notions. Since a system is a set of at least two elements that form a sequence, so is a system within a system or a subsystem. Thus, the teacher subsystem is a set of at least two behaviors ($t = t_1 \cup \ldots \cup t_n$ where $n \geq 2$) as is the learner subsystem. The curriculum and setting subsystems each also consist of 2 or more elements. The set theoretic notion of complement permits the selection of any of the four major components as the system, e.g. teacher, and the concomitant taking of the remaining three components as the negasystem, e.g. learner, curriculum, and setting.

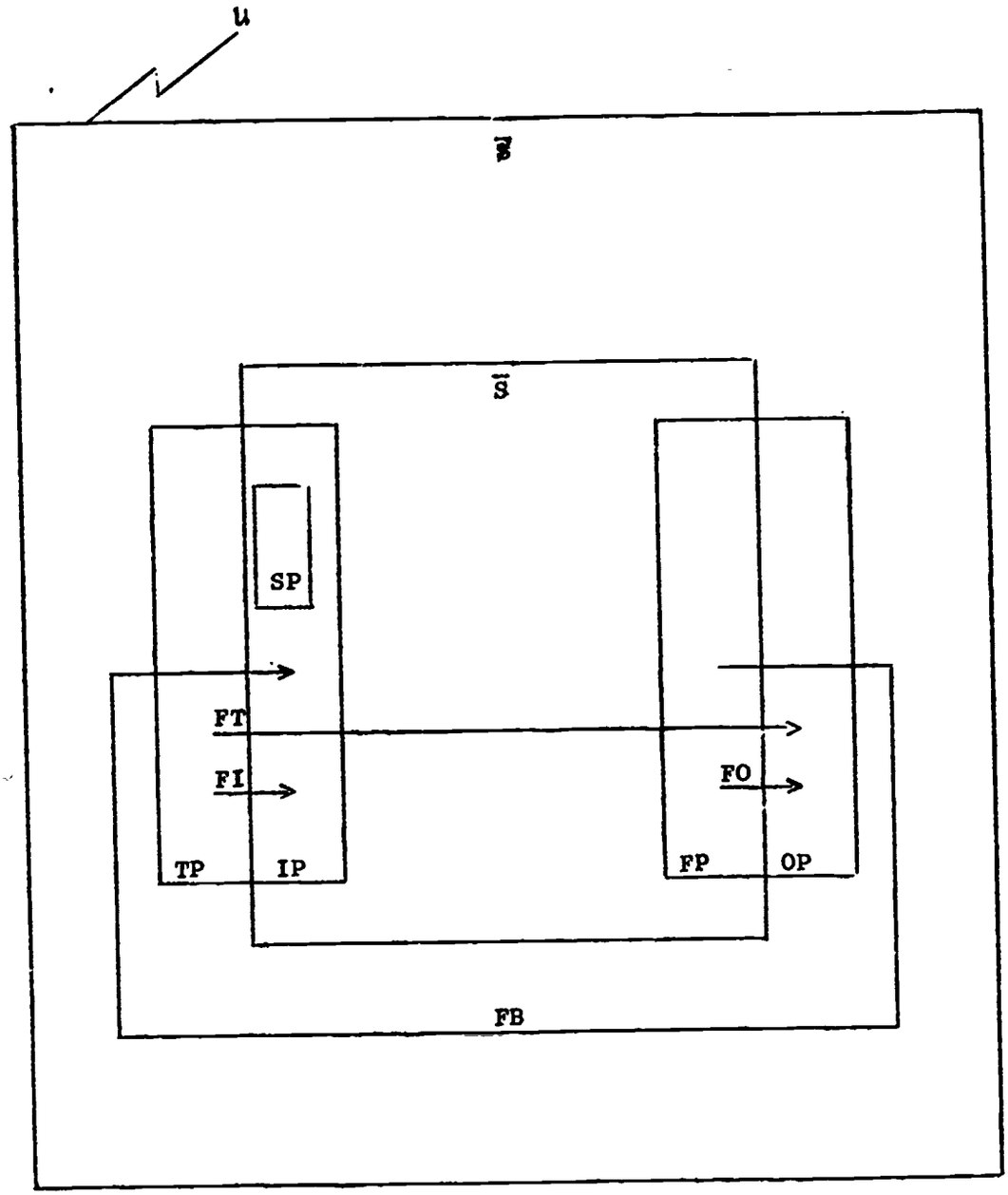
The information theoretic notions of SIGGS provide a framework for categorizing the behaviors or elements of the four major teaching-learning components. These components would be set forth within the set theoretic framework as described above. To illustrate, the verbal behavior of teachers

(initiating behavior consisting of either structuring or soliciting and reflexing behavior consisting of either responding or reacting[22]) can be treated as selective information and hence the probable occurrence of instances of teacher verbal behavior in the categories is determinable. That is to say, one can obtain an H measure or the amount of uncertainty for locating a given verbal behavior in any one of the categories. One could, of course, do likewise for learner verbal behaviors. In fact, all elements of the teaching-learning system or subsystems conceivably could be categorized thusly. Thereby SIGGS information theoretic properties, such as toput and input, can be used in developing teaching-learning theory.

Another advantage of SIGGS is its fruitfulness in characterizing interactive aspects of the teaching-learning process. Both information and graph theoretic notions help in this matter. First an example of an information theoretic notion of heuristic value. One can determine the flow of verbal behavior from learner to teacher through the concept of feedin, which is shared information. Taking an H measure on learner verbal behavior--the toput--and on teacher verbal behavior--input, then the commonality can be measured or a T measure obtained. Obviously, this could tell us of the interactive verbal pattern between learner and teacher. Is the learner getting through to the teacher? Is the teacher's verbal behavior as reflexive as the learner's is initiating? Etc.

A SIGGS graph theoretic notion met elsewhere in this paper will be cited again as it functions to treat of interaction. Centralness permits viewing the concentration of flow of verbal behavior in a group of many learners and a teacher. If there is much centralization in this size teaching-learning group, there is much verbal flow between the teacher and a few students and little verbal flow between the teacher and most of the students.

To complete this brief sketch of the new direction in SIGGS as a model for educational theory, it should be noted that the main shift is in the categorization of components and relations within education. It is a shift from the school to the teaching-learning process; a shift from a special case to the general. Accordingly, the hypotheses developed in the educational theory of the school will have to be modified. As an illustration, the hypothesis, CE↑ ——> TP↓, would be restated in terms of a teaching-learning group. As the channels between teacher and learners increase in concentration, there is a decrease in the learners' demands upon the teacher. Undoubtedly, this new direction will suggest hypotheses beyond the two hundred and one.



'U' stands for universe of discourse
'S̄' stands for system
'S̄̄' stands for negasystem
'SP' stands for storeputness
'FT' stands for feedthroughness
'FI' stands for feedinness
'TP' stands for toputness
'IP' stands for inputness
'FO' stands for feedoutness
'FP' stands for fromputness
'OP' stands for outputness
'FB' stands for feedbackness

Figure 1

(p. 99, Maccia and Maccia, 1966.)

INDIRECT SYSTEM CHARACTERIZATIONS

PRIMITIVE

1. universe of discourse, U
2. component, s
4. characterization, CH
10. condition, F
15. value, V

DEFINED

3. group, S
5. information, I
5-1. selective information, I_S
5-1-1. nonconditional selective information, I_S^N
5-1-2. conditional selective information, I_S^C
6. transmission of selective information, $\vec{I}(I_{S_1}, I_{S_2}, \ldots, I_{S_i}, \ldots, I_{S_n})$
7. affect relation, R_A
7-1. directed affect relation, R_{DA}
7-1-1. direct directed affect relation R_{DA}^D
7-1-2. indirect directed affect relation, R_{DA}^I
9. negasystem, $\overline{S}$
12. negasystem state, $ST_{\overline{S}}$
14. negasystem property, $P_{\overline{S}}$
17. negasystem property state, $ST_{P_{\overline{S}}}$
19. negasystem environmentness, $E_{\overline{S}}$
21. negasystem environmental changeness, $EC_{\overline{S}}$
24. fromputness, FP
25. outputness, OP

Table 1

(19, 21, 24, and 25 are negasystem properties.)

(p. 68, Maccia and Maccia, 1966.)

DIRECT SYSTEM CHARACTERIZATIONS

NON-PROPERTIES

8. system, $\overline{S}$
11. system state, $ST_{\overline{S}}$
13. system property, $P_{\overline{S}}$
16. system property state, $ST_{P_{\overline{S}}}$

PROPERTIES

18. system environmentness, $E_{\overline{S}}$
20. system environmental changeness, $EC_{\overline{S}}$
22. toputness, TP
23. inputness, IP
26. storeputness, SP
27. feedinness, FI
28. feedoutness, FO
29. feedthroughness, FT
30. feedbackness, FB
31. filtrationness, FL
32. spillageness, SL
33. regulationness, RG
34. compatibleness, CP
35. openness, O
36. adaptiveness, AD
37. efficientness, EF
38. complete connectionness, CC
39. strongness, SR
40. unilateralness, U
41. weakness, WE
42. disconnectionness, DC
43. vulnerableness, VN
44. passive dependentness, D_P
45. active dependentness, D_A
46. independentness, I
47. segregationness, SG
48. interdependentness, ID
49. wholeness, W
50. integrationness, IG
51. hierarchically, orderness, HO
52. flexibleness, F
53. homomorphismness, HM
54. isomorphismness, IM
55. automorphismness, AM
56. compactness, CO
57. centralness, CE
58. sizeness, SZ
59. complexness, CX
60. selective informationness, SI
61. size growthness, ZG
62. complexity growthness, XG
63. selective information growthness, TG
64. size degenerationness, ZD
65. complexity degenerationness, XD
66. selective information degenerationness, TD
67. stableness, SB
68. state steadiness, SS
69. state determinationness, SD
70. equifinalness, EL
71. homeostasisness, HS
72. stressness, SE
73. strainness, SA

Table 2

(p. 69, Maccia and Maccia, 1966.)

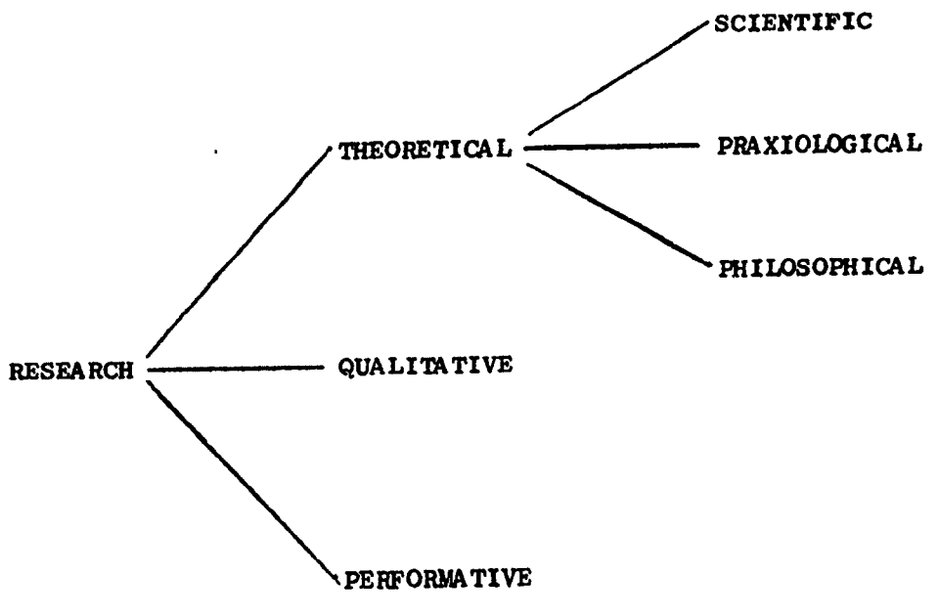


Figure 2: Kinds of Research

Figure 3: The Theory Models Approach

STATE OF AFFAIRS	TASK		ACHIEVEMENT	
	TEACHING	LEARNING	TEACHING	LEARNING
TEACHING	X			
EFFECTIVE TEACHING	X		X	
LEARNING		X		
EFFECTIVE LEARNING		X		X
EDUCATION	X	X		
EFFECTIVE EDUCATION	X	X	X	X

Table 3

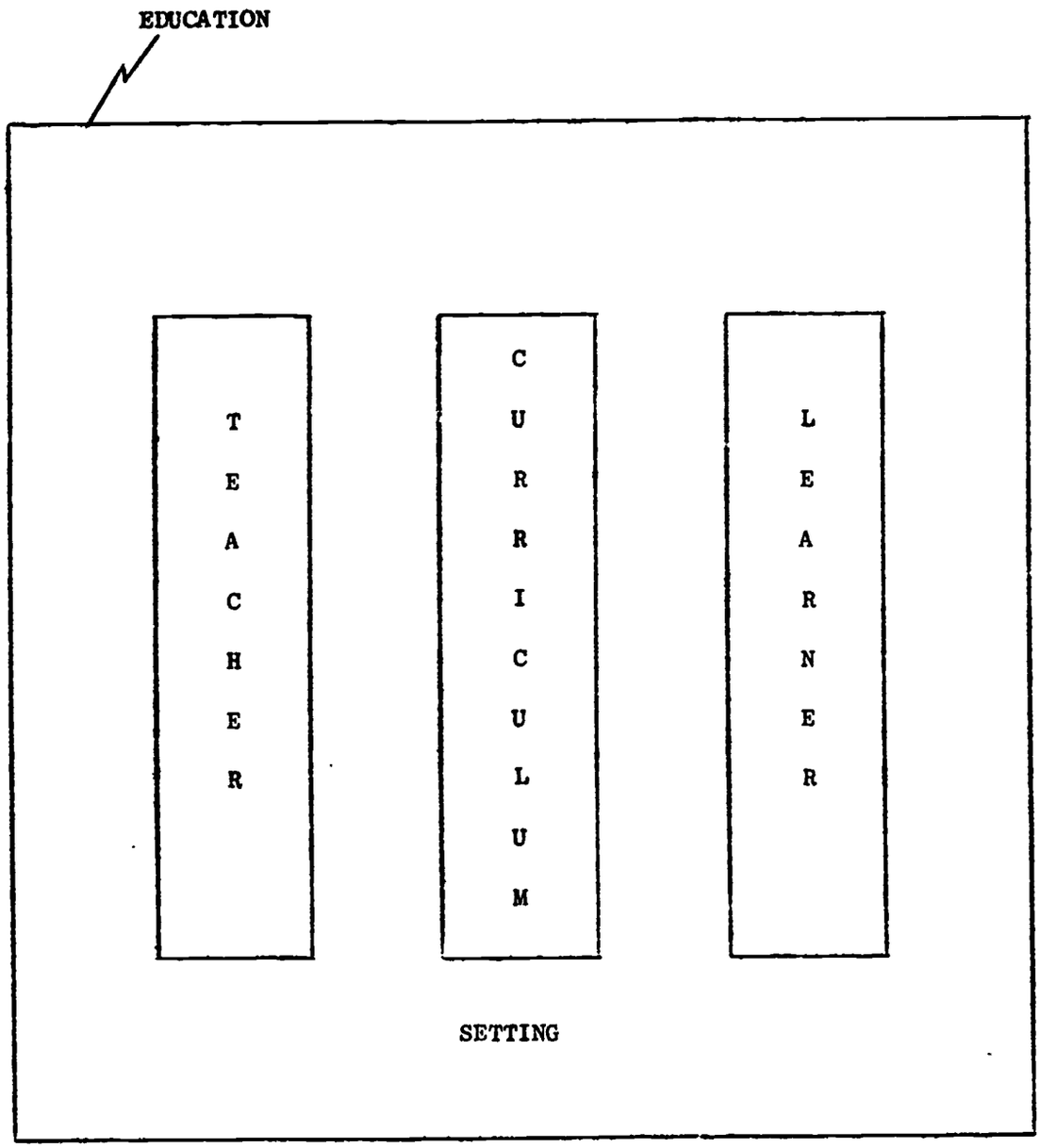


Figure 4: The Subsystems of Education

(Maccia and Maccia, 1972)

FOOTNOTES

1. The SIGGS Theory is developed fully in Project No. 5-0638, DEVELOPMENT OF EDUCATIONAL THEORY DERIVED FROM THREE THEORY MODELS, by Maccia and Maccia, U. S. Office of Education, December, 1966.

2. As is common in the literature, the plural of 'system' is used. It would make more sense not to because "General has the same meaning as s" (W. Ross Ashby, "General Comment," SOCIETY FOR GENERAL SYSTEMS RESEARCH, December, 1964, p. 3).

3. "General Systems Theory," MAIN CURRENTS OF MODEN THOUGHT, Vol. 71, 1955.

4. Kotarbinski introduced the term 'praxiology' for the discipline of effective action (PRAXIOLOGY, translated by Olgierd Wojtasiewicz, New York: Pergamon Press, 1965). Since 'technology' usually refers to physical praxiologies and carries with it the unwanted notion of techniques as practices limited in scope, the term 'praxiology' is more apt for knowledge of educational practices.

5. It is becoming obvious that 'observation' cannot be taken in the sense of the hard sciences, if we are to have sciences of human behavior. We must be able to get at covert as well as overt behavior. The phenomenological approach which opens up to us the contents ofconsciousness will undoubtedly become part of science's verificational moves. Thus, the sense of 'observation' will be stretched.

6. W. H. Rouse did the translation and these words of Plato are found in Book 9, 592.

7. Carl G. Hempel, "Recent Problems in Induction," MIND AND COSMOS, edited by Robert G. Colodny, University of Pittsburgh Press, 1966, p. 114.

8. VALUES IN A UNIVERSE OF CHANCE, pp. 370-371.

9. This approach was developed and used in two U. S. Office of Education research projects: the one cited in Footnote 1 and Project 1632, CONSTRUCTION OF EDUCATIONAL THEORY MODELS, by Maccia, Maccia, and Jewett, 1963.

10. W. K. Frankena, THREE HISTORICAL PHILOSOPHIES OF EDUCATION, Scott, Foresman and Company, 1965, p. 6.

11. Ibid., pp. 6-7.

12. "Philosophy of Educational Science," PROCEEDINGS OF THE INTERNATIONAL CONGRESS ON LOGIC, METHODOLOGY, AND PHILOSOPHY OF SCIENCE, Bucharest, 1971.

13. Table 3 is taken from "Conceptual Structures for Curriculum Inquiry," presented at the American Educational Research Association, 1972, p. 7.

14. In "Logic of Education and of Educatology: Dimensions of Philosophy of Education" (PROCEEDINGS OF THE PHILOSOPHY OF EDUCATION SOCIETY, 1964) E. S. Maccia introduced the term 'educatology' for the study of education. Following W. Gruen's suggestion, she changed to 'educology'. See "Analysis as Metatheorizing" (PROCEEDINGS OF THE PHILOSOPHY OF EDUCATION SOCIETY, 1970).

15. "Educational Theorizing Without Mistake," STUDIES IN PHILOSOPHY AND EDUCATION, Volume VII, Number 2, 1972.

16. It is the usual notion that theoretical knowledge, when it has progressed beyond the natural history stage, consists not only of descriptions but also of explanations. It is thought that the first or natural history stage is the description of states of affairs through setting forth their properties, i.e. characterizing states of affairs. The second stage is taken as explanation, i.e. setting forth why a state of affairs has a property through relating properties to other properties. The generalizations in the first stage are taken to be description, in the second explanations. Clearly, generalizations in the second stage are also descriptions, descriptions of connections between properties, albeit utilizable for explanation. See William P. Alston, "The Place of the Explanation of Particular Facts in Science," PHILOSOPHY OF SCIENCE, 38:1, March, 1971.

17. '——>' is not to be taken in the sense of only if. It indicates a connection which must be further explicated.

18. See the project cited in Footnote 1.

19. The Ocean-Hill Brownsville Case had to do with the dissention and disruption surrounding one ghetto community run demonstration school district in New York City. In MAN AND SYSTEMS, edited by M. Rubin (Gordon and Breach, 1971).

20. The model can be used even though there is a shift from the school as system to a group of schools as the system.

21. "Information Theoretic Extension of the Cybernetic Model and Theory of Education," presented at the World Organization of General Systems and Cybernetics, University of Oxford, August 28-September 1, 1972.

22. A. A. Bellack, et. al., THE LANGUAGE OF THE CLASSROOM, Teachers College Press, Columbia University, 1966.

PERSONAL DEVELOPMENT

FAMILY CHARACTERISTICS

PROCESS	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Financial Support for Education						

PERSONAL DEVELOPMENT

HIGH SCHOOL CHARACTERISTICS

DEMOGRAPHIC	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Type of High School		Students from public high schools were least stereotypic & dogmatic while students who had attended parochial high schools were most stereotypic & dogmatic & had the highest traditional value scores. (LAD,1)				
Size of High School & Size of Classes						

PERSONAL DEVELOPMENT

HIGH SCHOOL CHARACTERISTICS

DEMOGRAPHIC	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIOR	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Composition of Student Body		Negroes in schools with a higher proportion of whites had a greater feeling of control over their own destiny & more positive self-concept. These factors were strongly related to achievement. (C)				
Facilities-Resources						
Curricula						Minority groups had less access to curricular and extracurricular activities related to academic achievement. Secondary Negro students were less likely to attend accredited high schools (cont.)

PERSONAL DEVELOPMENT

HIGH SCHOOL CHARACTERISTICS

DEMOGRAPHIC	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Curricula (cont.)						especially in the south. Negro and Puerto Rican students had less access to vocational curricula. Caucasian students had the most access to more fully developed extracurricular activities, especially those related to academic matters (e.g., debate teams). (C)
						Of all students surveyed, vocational students indicated the most interest in their courses and vocational courses were considered to be the most useful. (Hil)
PROCESS Influence of Teachers & Counselors						

PERSONAL DEVELOPMENT

HIGH SCHOOL CHARACTERISTICS

PROCESS	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Influence of Peers						
Academic & Non-Academic Experience						
Persistence/ Withdrawal						

PERSONAL DEVELOPMENT

COLLEGE CHARACTERISTICS

	NEEDS·MOTIVES·INTEREST	ATTITUDES·VALUES·FEELINGS·BELIEFS	AWARENESS·KNOWLEDGE·UNDERSTANDING	ABILITIES·SKILLS·BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
College vs. No college	Lack of ambition was a key variable in becoming a non-attender. (SCOPE)	Positive identification between parent & child (father-son; mother-daughter) was less strong for non-attenders than for withdrawals. Moreover, students who did not go to college exhibited lack of self-confidence, apathy, & pessimism. They were resentful, frustrated with their school program & unresponsive to help school personnel tried to give. They were alienated from themselves & from the American way of life. In addition, non-attenders, more than the college-going groups felt that "the important things in life are not learned in college" & at grade 12 were considerably more interested in making money. (SCOPE)				
	Compared to employed youth, more college persisters reported having browsed in bookstores; attending theater, concerts, liking classical music & being interested in intellectual rather than "practical" professions. (T&W)	Those who felt a college degree was necessary for the kind of work they wanted to do tended to have higher than average scores on the culture, leadership & mature personality scales. (TAL)				
		Students who did not go to college reported that teachers & counselors were not enough like them (youthful) to empathize with their problems or else they dealt with them superficially. Males were more "turned off" by teachers, females by counselors. Non-attenders were not receiving the help they need from counselors & teachers. (SCOPE)				
		The least change in intellectual disposition & autonomy occurred among high school graduates not attending college. Those who attended college, particularly those who (cont.)				

PERSONAL DEVELOPMENT

COLLEGE CHARACTERISTICS

	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-INTEREST	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
College vs. No College (cont.)		persisted for four years changed the most. Women who entered homemaking immediately after high school changed the least & generally regressed in intellectual disposition & autonomy compared to their employed peers & particularly their college-attending peers. In addition, college students were significantly less religious, showed greater esthetic appreciation & interest in cultural activities, showed greater intellectual orientation & inquiry & greater tolerance for ambiguity than their employed peers. (T&M)				
		Changes in social attitudes, particularly the experience of questioning one's initial attitudes, & the relationship with reference groups (one's peers) were a function of the college experience. Collegiate deviants tended to change their attitudes less than did non-collegiate deviants & tended to accord higher status to one another than they accorded to non-collegiate deviants or to members of the dominant culture. (N)				

PERSONAL DEVELOPMENT

COLLEGE CHARACTERISTICS

DEMOGRAPHIC	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Type of College		Institutions which attracted the most intellectually disposed students were the independent universities; the vocational schools attracted those in the lowest quartile. (SCOPE) On the basis of a select & small sample, there were only slight differences in critical thinking, values & attitudes among students attending 2 small midwestern colleges & those attending a large university. Students at the large university did have significantly higher critical thinking scores than students at small church-related colleges. When critical thinking was controlled, the only significant difference was the stereotypic score for males. There was a significant difference between the three schools on the test of religious beliefs for women only. (L&D,1) Social maturity, intellectual disposition & autonomy scores were lowest among 2-year college students compared to students attending 4-year colleges & universities. There were no significant differences, however, in the degree of change in intellectual disposition & autonomy among students attending different types of colleges. The greatest positive change in autonomy over four years occurred among public college students--the least change among Catholic college students, followed by Protestants. (T&M)				

PERSONAL DEVELOPMENT

COLLEGE CHARACTERISTICS

DEMOGRAPHIC	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Size of College & Size of Classes						
Composition of Student Body						
Facilities & Resources						

PERSONAL DEVELOPMENT

COLLEGE CHARACTERISTICS

DEMOGRAPHIC	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Curricula, Major Fields		At college entry, students' critical thinking ability, values & attitudes differed according to major field of study; females in non-technical curricula such as social sciences, humanities & communication arts were less stereotypic & less dogmatic than females in vocationally oriented curricula. There were more marked differences between males in different curricula than between females. Those scoring high in the cognitive area tended to exhibit less stereotypic beliefs, less dogmatism & be less oriented toward traditional values. There were some significant differences between males who remained in their majors & those who changed majors. Those students who changed majors & had a low grade point average were the most dogmatic & stereotypic. The non-changers, however, had the highest mean traditional-value score. For females, there were no significant differences in stereotypy or dogmatism between the changers & non-changers. Female changers with low grade point averages had the highest traditional-value scores. (L&D,1)	If student and course objectives were not appropriately matched, the possibility increased that students would be frustrated and lose interest in learning and thereby resort to rote memory work only in place of growth in learning. (K)			
		Vocational orientation may have been the strongest influence working against the liberalizing effects of the curriculum; it constricted students' exploring various educational & occupational preferences & goals. (K)				

PERSONAL DEVELOPMENT

COLLEGE CHARACTERISTICS

PROCESS	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Influence of Teachers, Faculty Characteristics		Although most of the university students indicated that instructors and courses affected their attitudes, values and beliefs more than friends, all groups believed that their peers exerted a great influence. (L&D,2)				
Influence of Peers		Although most of the university students indicated that instructors and courses affected their attitudes, values and beliefs more than friends, all groups believed that their peers exerted a great influence. (L&D,2) Change in social attitudes were a function of membership in a subculture of peers whose attitudes were deviant from (incongruent with) the prevailing community norms. Change in the direction of acceptance of community norms was greater among students whose reference group was accepting of community norms. (N)				

PERSONAL DEVELOPMENT

COLLEGE CHARACTERISTICS

PROCESS	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Academic & Non-Academic Experiences		When freshmen who changed majors were analyzed, females reported a significant relationship between changes & a course or courses & cultural activities. Those who were traditional value-oriented indicated courses had an impact on their behavior. For males, those who had become less stereotypic reported that rules & regulations had an impact on their behavior. In the sophomore year, females mentioned courses & males mentioned the need to conform. For the junior & senior years the experiences related to positive change were. 1) close friends & dating, being away from home, sorority/fraternity & family. (L&D,1) In general, as subjects completed more college, they were more likely to cite academic experiences as having an impact upon them. Such experiences included classes and teachers in the major fields. University females indicated that they were influenced by non-academic experiences more than did male subjects, such experiences being friends, dating, and living away from home. First and second-year withdrawals, on the other hand, frequently indicated that non-academic aspects of college life, such as friends, "bull sessions," and merely living away from home, had more of an effect upon them than academic experiences. In addition, male university withdrawals cited general education courses as having a greater impact (cont.)				

PERSONAL DEVELOPMENT

COLLEGE CHARACTERISTICS

PROCESS	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Academic & Non-Academic Experiences (cont.)		on their attitudes & behavior than did seniors, who stressed major field experiences. (L&D,2)				
Persistence/ Withdrawal	Rankings of personal interests & activities changed strikingly little from freshman to senior years: career, family, love & affection & developing a personal identity were consistently seen as most important. (K) More persisters than withdrawals majored in academic subjects (natural science, social science & humanities) than applied subjects (engineering, education & business). (T&M)	The majority of high school graduates changed positively in intellectual disposition & especially autonomy during the first four years after high school; a significant proportion, however, changed negatively. College persisters tended to be more intellectual, self-reliant & open-minded before entering college, & even more intellectually oriented & autonomous after 4 years. Persisters compared to withdrawals or non-attenders showed significantly greater esthetic appreciation, greater positive change in autonomy, greater tendency towards reflective thought, tolerance for ambiguity, intellectual orientation, interest in cultural activities (e.g., preference for classical music) & less religious in orientation. In addition, more persisters than withdrawals felt college was extremely important; felt it extremely likely that they would graduate; saw the main purpose of education as the pursuit of knowledge & appreciation of ideas & reported academic reasons for their choice of college. More withdrawals saw the purpose of education as vocational training. More persisters than withdrawals or (cont.)				

PERSONAL DEVELOPMENT

COLLEGE CHARACTERISTICS

PROCESS	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Persistence/ Withdrawal (cont.)		non-attenders felt that their parents were "loving", had supportive temperaments, & while still in high school reported that their parents definitely wanted them to go to college, encouraged them to do so & reported parents & relatives, followed by teachers, as their greatest source of help during high school. (T&M) Between the freshman & senior years, there was a trend toward greater open-mindedness, tolerance for complexity & ambiguity, & rejection of a restricted view of life. There was also a widespread lessening of moralistic outlook by the senior year of college. Two-thirds of the freshmen felt large numbers of people were guilty of bad sexual conduct; only 1/3 agreed to this by the senior year. 75-90% of the seniors approved of pre-marital intercourse, inter-racial marriages, abortion & equality of sexual freedom for men & women. In addition, 42% of senior respondents said it was much easier to "feel close" to people as seniors than as freshmen; however, 20% said it was more difficult. In general, personal growth was more valued by seniors than intellectual growth. However, only 1/3 of the men and 1/2 of the women reported much change in personal characteristics after entering college; more than 1/3 of the seniors reported they felt more stable than they did as freshmen, had more (cont.)				

PERSONAL DEVELOPMENT

COLLEGE CHARACTERISTICS

PROCESS	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Persistence/ Withdrawal (cont.)		self-understanding, self-criticism, self-satisfaction, more emotional control & ability to face limitations, & a better defined philosophy & set of interests (i.e., they had experienced personal growth). (K)				
		There was a positive correlation between persistence in college & degree of liberalism in political attitudes. (N)				
		There was a significant difference in critical thinking, values & attitudes between those who completed the freshman year & those who withdrew. Those who completed the freshman year had significantly higher scores on the Inventory of Beliefs than those who withdrew. There were no significant differences in dogmatism or traditional-value orientation scores between the first year persisters and withdrawals. (L&D,1)				
		There were significant differences in critical thinking, values & attitudes from freshman year to sophomore, from freshman to senior, from sophomore to junior & junior to senior. Both males & females scored higher on the Inventory of Beliefs, as seniors than as freshmen & lower on traditional values & dogmatism. The greatest changes, however, took place in the first two years of college. The major changes in critical thinking appear to occur in the freshman year: there are less, but some, positive changes at the end of the sophomore and senior years, but no gains were noted for juniors. (L&D,1&2)				

PERSONAL DEVELOPMENT

COLLEGE CHARACTERISTICS

PROCESS	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Persistence/ Withdrawal (cont.)		By the senior year, students were more tolerant of racial & religious differences; were more respectful of others' views & valued families' advice to a greater extent than they did as freshmen. Although a majority reported that they had changed opinions, values & attitudes, a sizeable number of students reported no growth or change. A small percentage reported change in a negative direction. In fact, by the senior year, students did not feel that they had been fully prepared to meet the demands of the outside world & were apathetic concerning world affairs. (L&D,1)				
		A small percentage of both university persisters and withdrawals felt that they had changed in the direction of becoming less tolerant, less receptive to new ideas, and less respectful towards the views of others. (L&D,2)				
		Over three-fourths of both persisters and withdrawals believed that college had had a liberalizing effect on their views. (L&D,2)				
		The more college attended, the less respondents indicated an involvement in religion. Nonetheless, the proportion of students indicating that religion was valuable in leading a mature life did not change in the four years covered. There was no evidence that college made one more liberal or more absolute regarding religious beliefs: the four groups were more alike than not regarding concepts of God, sin,				

PERSONAL DEVELOPMENT

COLLEGE CHARACTERISTICS

PROCESS	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Persistence/ Withdrawal (cont.)		prayer, eternity, man and the Bible. (L&D,2)				

PERSONAL DEVELOPMENT

COMMUNITY CHARACTERISTICS

	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Region		Although there generally was an inverse relationship between level of educational aspiration & concern about one's stand on religion, males in No. Carolina with post-graduate aspirations were also highly concerned about their religious beliefs. In addition, males in Illinois with 2-year educational aspirations indicated that deciding "what kind of student to be" was more of a problem than did other groups. For females in No. Carolina this variable was negatively related to educational aspirations. (SCOPE)				
Urban/ Rural		For males, there was a significant difference on all variables except critical thinking. Males who lived most of their life on a farm were more stereotypic, dogmatic & traditional-value oriented. Females who lived most of their life on a farm were also more traditional-value oriented. (L&D,1)	A major adjustment for many students, particularly those from rural areas, was the awareness that they were not "first" anymore in the academic, social, & athletic competition. (K)			
Socioeconomic Status (SES)						

PERSONAL DEVELOPMENT

COMMUNITY CHARACTERISTICS

	NEEDS-MOTIVES-INTEREST	ATTITUDES-VALUES-FEELINGS-BELIEFS	AWARENESS-KNOWLEDGE-UNDERSTANDING	ABILITIES-SKILLS-BEHAVIORS	ACHIEVEMENT	SATISFACTION & OPPORTUNITIES
Higher Education Resources						

GENERAL EDUCATIONAL DEVELOPMENT

Personal Variables

Personal/ Interpersonal	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
Sex	Need for conformity, dominance, nurturance, social approval, status and recognition. (A&M)	Level of involvement in high school and attitude toward school, teachers and counselors. (M;SCOPE;T&M)	Knowledge of information. (26 areas) (TAL)	IQ--general mental abilities. (H;A&M,L&D1&2,SCOPE,TAL,T&M)	Intellectual (cognitive) achievement (Hil;A&M,M,TAL)	Satisfaction with high school teachers and counselors. (SCOPE;T&M)
	Achievement motivation--need for mastery and achievement.(A&M,SCOPE)	Attitude toward peers--identification with peer groups. (N;SCOPE;T&M)	Knowledge and understanding of mathematics. (H)	Achievement behavior. (A&M)	Mechanical and athletic achievement. (K&M)	Job satisfaction (TAL)
	Fear of failure/test anxiety. (A&M)	Attitudes toward problems and conflicts. (SCOPE)	Awareness of self/sense of identity. (K)	Personality behaviors--passiveness/aggressiveness, dependence/independence, dominance/conformity, compulsiveness, impulsivity, withdrawal/anxiety, behavioral disorganization, competitiveness; hyperkinesis. (A&M,M)	Mathematics achievement. (H;Hil)	
	Fear of physical harm. (K&M,M)	Regrets about not having gone to college. (TAL)	Knowledge and attitudes about current issues. (L&D1)		Post-high school employment. (TAL)	
	Hobbies and interests. (SCOPE)	Attitudes toward mathematics. (H)			Entrance into college and type of college. (A;A&P;L&D2;T&M)	
	Exploration of adult-oriented roles and role conflicts (SCOPE;T)	Attitude toward college/college faculty/objectives of higher education. (A;L&D2,T&M)		General affective behaviors (e.g., frankness, mannerisms, friendliness, speech). (M)	Persistence/withdrawal from college. (A,A&P;L&D2;T&M)	
	Interest in mathematics. (H)	Self-perceived changes and growth in attitudes, values and beliefs. (A,L&D2)		Social, dating and sexual behavior. (A,A&P,K;K&M,SCOPE)	Academic achievement in college. (A;A&P)	
	Interest in general high school subject-matter areas and courses. (TAL,S)	Critical thinking. (L&D1&2)		Enrollment status. (C)	Changes in values and attitudes. (L&D1&2)	
	Educational aspirations and plans. (A,A&P,B,SCOPE,TAL;T&M;H)	Intellectual disposition. (K;L&D2; SCOPE;T&M)		Contact with school personnel. (SCOPE)	Entrance into graduate school. (T)	
	Interest or choice of college major field. (A;A&P;L&D2,T)	Autonomy, authoritarianism, social maturity, dogmatism, and tolerance for ambiguity.(A;L&D2;SCOPE;N;TAL;T&M)		School related behaviors. (TAL)		
	Aspiration to graduate school. (A,A&P,L&D2;SCOPE,TAL;T;T&M)	Aesthetic, economic, political, social and theoretical values, traditional vs emergent values. (L&D2; T&M)				
	Changes in aspirations to graduate school. (T)	Attitude toward sex, marriage, love, affection and decision-making in marriage. (K;L&D)				
		Attitude toward religion.(L&D2;T&M)				

GENERAL EDUCATIONAL DEVELOPMENT

Personal Variables

Personal/ Interpersonal	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Acheivements	Satisfactions and Opportunities
Race	Need for social approval. (B)	Self-concept. (B;C)	Political knowledge. (B)	IQ and aptitude tests. (B;Hil)	General academic achievement. (B;C; Hil)	Integrated vs segregated schools. (C)
	Need for self-actualization. (B)	Attitude toward school. (B;C)		Negative affective states (e.g. general anxiety, depression, irritability, resentment). (B)	Persistence/withdrawal from high school. (C)	Accreditation of schools. (C)
	Educational and vocational aspiration. (B,C;SCOPE)	Social values. (B)		Impulse to aggression. (B)	Entrance into college and type of college attended. (C;SCOPE)	School facilities including characteristics of the student body. (C)
	Interest in and choice of high school curricula. (C;Hil)	External vs internal control. (B;C)		Rebellion behavior in school. (B)	Persistence/withdrawal from college. (A&P)	Access to college preparatory, vocational, and remedial reading programs. (C)
	Interest in and choice of college curricula. (A;A&P)	Concern about work vs college. (SCOPE)		Enrollment status. (C)		Quality of teachers, counselors, and administrators. (C)
		Occupational expectations. (C)		Number of days absent from school. (C)		Access to extra-curricular activities. (C)
				Number of books read during summer. (C)		Access to college with favorable academic environments. (C)
						Per-pupil expenditure in college. (C)
						Happiness. (B)

GENERAL EDUCATIONAL DEVELOPMENT

Personal Variables

Personal/ Interpersonal	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
Academic Aptitude, Intelligence and Grade-Point Average	Need for social approval. (B)	Self-concept and self-esteem. (B)	Political knowledge. (B)	Changes and growth in IQ. (M)	High school achievement tests. (TAL)	Occupational satisfaction. (S)
	Need for self-actualization. (B)	Attitude toward school. (B)		Age at which started school. (TAL)	Persistence/withdrawal from high school. (Hil)	Happiness. (B)
	Choice of academic vs non-academic high school curricula. (Hil;TAL;T&M)	Social values. (B)		Achievement behavior and intellectual mastery. (K&M)	Entrance into college and type of college attended. (Hil;SCOPE;S;TAL;T&M)	
	Interest in mathematics. (H)	Orientation to college and curriculum. (K)		Rebellious behaviors in school. (B)	Level of achievement in specific areas and general college achievement. (A&P)	
	Educational and vocational aspiration. (A&P;M;H;L&D2;SCOPE;TAL;T;T&M)	Critical thinking, values, and attitudes. (L&D2)		Negative affective states. (B)	Improvement in educational status and educational and vocational levels attained. (B;M;S;T&M)	
	Major field. (A&P;H)	Regret about not having gone to college. (TAL)		Study habits. (TAL)	Entrance into graduate school. (T;T&M)	
	Aspiration to graduate school. (A;A&P;T)			Career development criteria: realistic reasons for changing jobs and floundering vs stabilizing behavior. (S)	Rate of unemployment during first four years after high school. (T&M)	
	Changes in aspirations to such graduate training. (T)				Persistence/withdrawal from college. (TAL;T&M)	
					General academic achievement. (B;L&D1&2)	

GENERAL EDUCATIONAL DEVELOPMENT

Personal Variables

Personal/ Interpersonal	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
Early Childhood Behaviors	Need for status and social recognition. (K&M)	Sex-role anxiety and social anxiety. (K&M)		School-age behaviors: passivity/ aggressiveness, avoidance of dangerous activity, conformity, timidity, competitiveness. (K&M)	Achievement, intellectual mastery and competence as adults. (K&M)	Occupational satisfaction. (S)
	Career choice. (K&M)			Dependency on parents. (K&M)		
				Physical aggression to peers and mother. (K&M)		
				Withdrawal as parents. (K&M)		
				Adult competitiveness. (K&M)		
Age Age Started School and Age in Grade	General interests and activities. (Hil)	Identification with Protestant work ethic. (SCOPE)	Subject-matter knowledge, (Grade 9 contributed to grade 12). (TAL)	IQ. (M)	Grade level achievement. (TAL)	
	Stability of career aspirations. (TAL)			Stabilizing vs floundering career behavior. (S)	Mathematics achievement. (H)	
	Changes in aspirations to graduate school. (T)				Persistence/withdrawal from high school. (Hil)	
					Changes in critical thinking, values and attitudes. (L&D2)	
					Educational and occupational level attained at age 25. (S)	

GENERAL EDUCATIONAL DEVELOPMENT

Personal Variables

Personal/ Interpersonal	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
Personality Characteristics and Dispositions	Interest and attention in school subjects. (TAL)	Importance of college. (SCOPE;TAL; T&M)		Cognitive test scores. (TAL)	High school achievement. (C;TAL)	Effects of college curricula. (K)
	Aspiration to enter college. (SCOPE, TAL,T&M)	Orientation to college and the curriculum. (K)		Anxiety (test and social). (K&M,B; M,N,T&M)	Maturity/immaturity. (K)	
	Independence/dependence on parents. (K)	Practicality. (K)		Work habits, reading problems. (TAL)	Entrance into college. (SCOPE)	
	Choice of major field and career. (A&P;K;L&D2)	Political attitudes. (N)		Rebellious independent. (N)	Academic achievement in college. (K,L&D1)	
		Critical thinking, values and attitudes. (L&D2;T&M)			Persistence/withdrawal from college. (T&M)	
		Tolerance for ambiguity; rigidity/ flexibility; pessimism/optimism. (K;L&D2;T&M)				
Psychological Adjustment and Maturity	Aspiration to enter college. (SCOPE)	Adjustment to failure or success. (M)	Awareness of self (identity crises). (K)	Job stability. (S)	Academic achievement. (C;TAL)	Satisfaction with intellectual pursuits. (K)
	Intellectual interests. (K)	Attitudes toward problems and conflicts. (SCOPE)			Entrance into college. (SCOPE)	Occupational satisfaction at age 25. (S)
		Reasons for going to college. (SCOPE				
		Perception of value of parental advice. (L&D;S;SCOPE;TAL;T&M)				
		Attitude toward life, self, and peers. (K)				
		Change in social attitudes and acceptance of community norms. (N)				

GENERAL EDUCATIONAL DEVELOPMENT

Personal Variables

Personal/ Interpersonal	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
Educational Aspirations, Motivations and Interests	Educational aspiration. (M)	Students' concern with problems regarding college; rejection by college; choice of major. (SCOPE)	Levels of cognitive information. (TAL)	IQ. (M)	High school achievement. (A&P;B;C; L&D;TAL;T;T&M)	Occupational satisfaction at age 25. (S)
	Choice of vocation, college major and career. (A&P;Hil:TAL;T&M)	Concern with potential problems related to employment. (SCOPE)		12th grade cognitive scores. (TAL)	Mathematics achievement. (H)	
	Aspiration to graduate school. (A;A&P;T)	Concern with religious beliefs; and social and political problems. (SCOPE)			Improvement in educational status. (S)	
		Critical thinking, values and attitudes. (L&D1)			Entrance into college. (SCOPE)	
					Persistence/withdrawal from college. (T&M)	
Miscellaneous					Entrance into graduate school.(T)	
Marital Status				Academic aptitude. (TAL)	Completion of college. (A&P)	

GENERAL EDUCATIONAL DEVELOPMENT

Personal Variables

Miscellaneous	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievement	Satisfactions and Opportunities
Social/Political	Educational and vocational aspiration. (B)	Self-concept. (B)	Tolerance; unconventiality; intellectualism; questioning ones' initial attitude--intellectual disposition. (N)	IQ. (B)	High school grades. (B)	Happiness. (B)
	Need for social approval. (B)	Social values. (B)		Negative affective states. (B)	Changes in political attitudes. (K)	
	Need for self-actualization. (B)	Attitude toward school. (B)		Rebellious behavior in school. (B)	Acceptance of community norms. (N)	
		Personal-social problems. (SCOPE)		Political knowledge. (B)		
Cultural/ Aesthetic		Political attitudes. (N)				
		Traditional vs emergent values. (L&D1)				

GENERAL EDUCATIONAL DEVELOPMENT

Personal Variables

Spiritual, Religious, Humanistic	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
Attitudes, Orientations and Experiences	Need for social approval. (B)	Self-concept. (B)	Political Knowledge. (B)	IQ. (B)	Entrance into college. (SCOPE)	Happiness. (B)
	Need for self-actualization. (B)	Attitude toward school. (B)		Negative affective states. (B)	Changes in religious attitudes. (K)	
	Vocational aspirations. (B;SCOPE;T&M)	Social values. (B)		Rebellious behaviors in school. (B)		
	Choice of major field (A&P;T&M)	Intellectual disposition and autonomy. (T&M)		High school grades. (B)		
Cognitive		Critical thinking, values, and attitudes. (L&D;T&M)				
Kinds of Learning	Career choice. (TAL)	Orientation to college and the curriculum. (K)			Reasoning vs memorization and changes during high school years. (TAL)	

GENERAL EDUCATIONAL DEVELOPMENT

Personal Variables

Vocational	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
Interests, Orientations, Career Choice, Experiences and Information	Interest in vocational courses. (Hil)	Personality variables (e.g. tolerance for ambiguity, interest in reflective thought, social maturity and autonomy). (T&M)		IQ. (M)	Mathematics achievement. (H)	Self-estimated career satisfaction. (TAL;S; T&M)
	Final career choice. (A&P)	Intellectual and aesthetic orientation. (T&M)		Career development criteria: realistic reasons for changing jobs, improvement of educational status and stabilizing vs floundering career behaviors. (S)	Type of college attended. (T&M)	
	Aspirations for graduate school. (A;A&P)	Religious orientation. (T&M)		Number of jobs held. (S)	Post-high school educational attainment. (Hil;S;TAL;T&M)	
					General college achievement. (A&P)	
					Persistence/withdrawal in college. (A&P)	
					Occupational level attained by age 25. (S)	

GENERAL EDUCATIONAL DEVELOPMENT

Family Environment Variables

Demographic	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
Socioeconomic Status (SES)	Need for social approval. (B) Need for self-actualization. (B) Interest in mathematics. (H) Enrollment in academic vs vocational high school curricula. (Hi1;H;TAL;T&M) Educational and vocational aspiration (A;A&P;B;SCOPE;TAL;T&M) Career choice in college. (A&P) Occupational choice. (T&M) Aspiration to graduate school. (A&P;T)	Self-concept and self-esteem. (B;T&M) Attitude toward school. (B) Social values. (B) Scores on personality scales. (TAL) Concern about problems related to college. (SCOPE) Critical thinking, values and attitudes. (L&D1)	Political knowledge. (B)	IQ and changes in mental test scores. (H) Mathematics aptitude. (H) Academic aptitude. (B,TAL;T&M) Rebellious behavior in school. (B) Negative affective states. (B) Marital status 5 years after high school. (TAL) Career development criteria: realistic reasons for changing jobs and stabilizing vs floundering career behavior at age 25. (S)	Cognitive and affective achievement. (B,C,Hi1;TAL) Mathematics achievement. (H) Entrance into college and type of college attended. (Hi1;SCOPE;S;TAL;T&M) Persistence/withdrawal from college. (A&P;TAL,T&M) Occupational unemployment. (T&M) Occupational level attained at age 25. (S) Entrance into graduate school. (T)	Occupational satisfaction at age 25. (S) Happiness. (B)
Educational Level of Parents	Passivity/aggressiveness; independent/dependent. (K&M) Choice of high school curriculum. (Hi1) Choice of major field and career in college. (A&P) Aspiration to graduate school. (A;T)	Scores on personality scales. (TAL) Critical thinking, values and attitudes. (L&D1)		IQ and changes in mental test scores. (H) Academic aptitude. (L&D1,SCOPE;TAL)	Academic achievement. (C) Entrance into college. (SCOPE;T&M) Changes in values and attitudes. (L&D1) Entrance into Graduate School. (T) Persistence/withdrawal from college. T&M) Adult achievement and intellectual mastery. (K&M)	

GENERAL EDUCATIONAL DEVELOPMENT

Family Environment Variables

Demographic	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
Size of Family and Influence of Siblings Process	Educational and vocational aspirations. (B)	Self-concept and self-esteem. (B) Social values. (B) Attitude toward school. (B) Scores on personality scales. (TAL)	Political knowledge. (B)	IQ. (B)	Academic achievement. (B,C) Entrance into college. (SCOPE)	
Psychological Environment of the Home and Child-Rearing Practices	Need for social approval. (B) Need for self-actualization. (B) Educational and vocational aspirations. (B;SCOPE:K:T&M)	Self-concept and self-esteem. (B) Attitude toward school. (B;SCOPE) Positive social values (e.g. kindness, honest, responsibility, social skills). (B) Orientation to college and curricula (K) Shared values and attitudes. (K)		IQ and changes in mental test scores (B,M) Pre-adolescent and adult behaviors including rebellious behaviors in school. (B;M) Coping with anger and hostility. (K) Vocational development criteria. (S)	Intellectual achievement and mastery (A&M) Academic achievement. (B;C) Relationship between school characteristics and student achievement. (C) Entrance into college. (SCOPE) Persistence/withdrawal from college. (T&M)	
Philosophy of Education in the Home	Enrollment in academic vs vocational high school curricula. (Hil;SCOPE; T&M) Plans to attend college. (SCOPE;TAL; T&M) Aspiration to graduate school. (A)	Closeness vs alienation from parents (SCOPE)		IQ and changes in mental test scores. (M)	Entrance into college and type of college. (Hil;SCOPE;T&M) Academic achievement. (C;Hi:) Persistence/withdrawal from college. (T&M)	
Financial Support for Education					Mathematics achievement. (H) Entrance into college. (SCOPE) Completion of college and a degree. (A&P;T&M) Entrance into graduate school. (T)	

GENERAL EDUCATIONAL DEVELOPMENT

High School Environment Variables

Demographic	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
Type of High School	Interest in mathematics. (H) Enrollment in academic vs vocational high school curricula. (Hil)	Critical thinking, values and attitudes. (L&D1)		Cognitive test scores-academic ability. (TAL) Delinquency rate. (TAL)	Mathematics achievement. (H)	Use of standardized tests. (TAL)
Size of High School and Size of Classes					Mathematics achievement. (H) General cognitive and affective high school achievement. (C;TAL)	
Composition of Student Body		External vs internal control. (C)		IQ. (B)	General academic achievement. (C; Hil) Mathematics achievement. (H)	
Facilities-Resources				Abstract reasoning. (TAL) Delinquency rates. (TAL)	General academic achievement. (C;Hil) Mathematics achievement. (H) Entrance and persistence in college. (TAL)	
Curricula	Interest in courses. (Hil) Educational motivation. (C) Educational and vocational aspiration. (Hil;T&M) Aspiration to graduate school. (A)	Liberalization of values and attitudes (testing educational and occupational goals). (K)		Career development criteria, (e.g. realistic reasons for changing jobs, stabilizing vs floundering career behavior. (S)	General academic achievement. (C;TAL) Mathematics achievement. (H) Entrance into college. (TAL;T&M;Hil) Graduation from college. (TAL;T&M) Occupational level attained at age 25. (S)	

GENERAL EDUCATIONAL DEVELOPMENT

High School Environment Variables

Process	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
Influence of Teachers and Counselors	Educational and vocational aspirations. (SCOPE) Educational and vocational decisions. (TAL)			"Fit" between aspirations and ability. (C)	General academic achievement. (C;TAL) Mathematics achievement. (H) Entrance into college. (SCOPE;TAL) Persistence/withdrawal from college. (T&M)	Satisfaction with job-related decisions. (SCOPE;TAL)
Background and Training of Teachers, Teachers Characteristics					General academic achievement. (C;TAL) Mathematics achievement. (H) Entrance and persistence in college. (TAL)	
Influence of Peers	Enrollment in academic vs vocational curricula. (Hil) Educational and vocational aspiration. (SCOPE) Aspiration to graduate school.	External vs internal control. (C)	Perception and knowledge of different occupations. (B;S;SCOPE;TAL)		General academic achievement. (C) Mathematics achievement. (H) Persistence/withdrawal from college. (T&M)	
Academic and Non-Academic Experience.	Disposition to seek graduate training. (T)			Realism of reasons for changing positions; stabilizing vs floundering career behavior. (S)	Academic achievement. (Hil;TAL) Unemployment. (S) Educational and occupational level attained at age 25. (S)	Minority vs majority access to curricular and extra-curricular activities. (C)
Persistence/ Withdrawal			Gains in abstract reasoning. (TAL)	Academic ability tests. (Hil)	Achievement test scores. (Hil;TAL) Occupational level attained. (S)	Satisfaction with occupational attainment. (S)

GENERAL EDUCATIONAL DEVELOPMENT

School Environment Variables

	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
College vs No College	Vocational aspirations. (SCOPE;S;T&M)	Scores on culture, leadership and mature personality scales. (TAL)		Entrance into military service. (TAL;T&M)	Positive vocational movement vs negative and unemployment. (S;T&M)	Vocational satisfaction. (T&M)
	Interest in intellectual vs practical occupation. (T&M)	Changes in social attitudes and relationships with peer groups. (N)		Number of jobs held. (S)	Vocational level attained. (S;T&M)	
	Interest in intellectual activities (e.g. books, classical music, theater). (T&M)	Tolerance for ambiguity; social maturity and autonomy. (T&M)			Changes in values and attitudes. (L&D2)	
		Intellectual disposition; esthetic and cultural orientation. (T&M)				
		Religious orientation. (T&M)				

GENERAL EDUCATIONAL DEVELOPMENT

College Environment Variables

Demographic	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
Type of College	Choice of college major and career. (A&P)	Critical thinking, values and attitudes. (L&D1)		Academic aptitude. (A&P,SCOPE,TAL; T&M)	Persistence/withdrawal from college. (A&P;TAL;T&M)	Quality of majority vs minority colleges. (C)
	Intellectual interests. (T&M)	Social maturity, autonomy and intellectual disposition. (SCOPE;T&M)				
	Aspiration to graduate school. (A;A&P;T&M)	Religious orientation. (T&M)				
Institutional Quality	Aspiration to graduate school. (A&P)				Persistence/withdrawal from college. (A&P)	
	Choice of major field and career. (A&P)				General college achievement. (A&P)	
Size of College and Size of Classes	Aspiration to graduate school. (A)	Critical thinking, values and attitudes. (L&D1)			Persistence/withdrawal from college. (A&P)	
	Choice of major field and career.(A&P)					
Composition of Student Body	Aspiration to graduate school. (A; A&P)				Persistence/withdrawal from college. (A&P)	
Facilities-Resources	Aspiration to graduate school. (A;A&P)				College achievement. (A&P)	
					High school achievement. (Hil)	
Curricula, Major Field	Preferences among Negroes vs Caucasians. (C)	Critical thinking, values and attitudes. (L&D1)	Growth in learning. (K)	Changes in major field and career choice. (A&P;L&D1&2)	General undergraduate achievement. (A&P)	
	Motive for choice of field. (K)	Liberalization of attitudes and values. (K)			Orientation to curricula and grade point average. (K)	
	Aspiration to attend graduate school. (A,A&P;T)				Change in values and attitudes.(L&D1)	
					Persistence/withdrawal from college. (A;A&P;T&M)	
					Entrance into graduate school. (T)	

GENERAL EDUCATIONAL DEVELOPMENT

College Environment Variables

Process	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
Influence of Teachers--Faculty Characteristics	Motivation to graduate school. (T)	Critical thinking, values and attitudes. (L&D1&2)			Persistence/withdrawal in college. (A&P) Entrance into graduate school. (T) Changes in values and attitudes. (L&D1)	Satisfaction with teachers. (L&D1&2)
Influence of Peers--Orientations of Student Subcultures	Choice of major field and career. (A&P) Motivation to graduate school. (A;T)	Critical thinking, values, and attitudes. (L&D1&2) Changes in social attitudes and acceptance of community norms. (N) Individualsim and intellectualism. (N) Persistence of changes in political attitudes. (N)			Persistence/withdrawal from college. (A&P;N) Entrance into graduate school. (T) Changes in values and attitudes. (L&D1)	
Academic and Non-Academic Experiences (Dating, Research Projects, Scholarships received, etc.)	Choice of major field and career. (A&P) Aspiration to graduate school. (A&P; T)	Critical thinking, values and attitudes. (L&D1)			Persistence/withdrawal from college. (A&P) Entrance into graduate school. (T) Changes in values and attitudes. (L&D1)	

GENERAL EDUCATIONAL DEVELOPMENT

College Environment Variables

Process	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
Persistence/ Withdrawal	Personal interests and activities. (K)	Liking work vs steadiness of employment most important for job satisfaction. (T&M)		Academic aptitude. (A&P;TAL;T&M)	Changes in values and attitudes. (L&D1)	Satisfaction with classes. (L&D2)
	Interest in intellectual vs practical occupation. (T&M)	Importance of college. (T&M)		Transfer from one college to another (A&P;SCOPE;T&M)	Years to obtain degree. (A&P)	Satisfaction with grades. (L&D2)
	Interest in cultural, aesthetic and intellectual activities. (T&M)	Certainty of graduating from college. (T&M)				
	Certainty of future plans. (L&D2)	Feelings toward family, teachers, and peers. (K;T&M)				
	Planned participation in community activities. (L&D2)	Attitudes toward sex and morale. (K)				
	Aspiration to do post-graduate work. (T)	Religious orientation and tolerance. (K;L&D2;T&M)				
		Importance of liberal vs vocational education. (L&D1&2;T&M)				
		Importance of grades. (L&D2)				
		Tolerance for ambiguity; interest in reflective thought and cultural and esthetic activities. (K;L&D2;N;T&M)				
		Critical thinking, values and attitudes. (L&D1&2)				
		Attitude toward world affairs. (L&D1)				
		Attitude toward faculty ideology and performance. (L&D2)				
		Liberal vs conservative political attitudes.				
		Political, social and economic opinions. (L&D2)				

GENERAL EDUCATIONAL DEVELOPMENT

College Environment Variables

Process	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievement	Satisfactions and Opportunities
Persistence/ Withdrawal		Persistence of change in political attitudes. (N) Change in intellectual disposition autonomy and social maturity. (T&N) Self-reported emotional control; stability; self-esteem and understanding. (K) Value of personal vs intellectual growth. (K)				

GENERAL EDUCATIONAL DEVELOPMENT

Community Environment Variables

	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievement	Satisfactions and Opportunities
Region	Congruence between ideal and anticipated occupations and educational aspirations. (SCOPE)	Self-concept. (C)		IQ. (B)	Academic achievement in high school. (TAL)	Parental support and encouragement for education. (SCOPE)
	Preference for vocational education. (C)	External vs internal control. (C)		Verbal and non-verbal ability tests. (C)	Persistence/withdrawal from high school. (C)	Use of standardized tests. (TAL)
	Educational and vocational aspiration (A&P;C;Hil;SCOPE)	Concern with problems related to college. (SCOPE)		Enrollment status. (C)	Percentage of college enrollment. (C;SCOPE;TAL)	Availability of guidance programs (TAL)
	Major field and career choice. (A&P)	Concern with potential problems related to employment. (SCOPE)		Number of days absent from school. (C)	Type of college attended. (C;SCOPE; T&W)	School facilities including student body characteristics. (C)
		Concern about religious beliefs. (SCOPE)		Number of books read during summer. (C)	Persistence/withdrawal in college. (A&P)	Accreditation of school. (C)
		Occupational expectations. (C)				Integrated vs segregated schools. (C)
		Intellectual predisposition. (SCOPE)				Access to remedial readings, college preparatory and vocational curricula. (C)
						Quality of teachers, counselors and administrators. (C)
						Access to extracurricular activities. (C)
						Access to colleges with favorable academic environments. (C)

GENERAL EDUCATIONAL DEVELOPMENT

Community Environment Variables

	Needs-Motives-Interests	Attitudes-Values-Feelings-Beliefs	Awareness-Knowledge-Understanding	Abilities-Skills-Behaviors	Achievements	Satisfactions and Opportunities
Region						Per-pupil expenditures in college. (C)
Urban/Rural		Critical thinking, values and attitudes. (L&D1) Adjustment to college. (K)			Mathematics achievement. (H) Academic achievement. (C;Hil:TAL) Changes in values and attitudes. (L&D1) Persistence/withdrawals from high school. (C)	
Socio-Economic Status (SES)	Educational aspirations. (Hil)			Entrance into military service. (T&M)	Academic achievement. (TAL) Occupational level attained. (T&M)	Residence in home community after high school. (T&M)
Higher Education Resources (Availability of Colleges)	High school curricula. (Hil)				Entrance into college. (Hil;SCOPE; TAL;T&M)	
Size of Community	Need for social approval. (B) Need for self-actualization. (B) Educational and vocational aspiration. (B)	Self-concept. (B) Social values. (B) Attitude toward school. (B)	Political knowledge. (B)	IQ. (B) Negative affective states. (B) Impulse to aggression. (B) Rebellious behavior in school. (B)	High school grades. (B)	Happiness. (B)