

STRUCTURE OF THE DISCIPLINES AS AN EDUCATIONAL SLOGAN

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Almost half a century ago, William Heard Kilpatrick raised the question as to whether the new and exciting term *project method* ought to be admitted into educational discourse (5). He gave it an unqualified endorsement. Ever since the publication of Jerome Bruner's influential book (3), *structure of the disciplines* has generated the same kind of excitement, not only on the part of educationists, but among academicians as well. The proposal that the structure of the disciplines can provide a workable basis for curriculum organization seems to have struck a responsive chord among many who apparently see it as a desirable substitute for such other watchwords as *core* and *life adjustment*, which are falling or have fallen out of popular and professional favor. In just a few years, *structure of the disciplines* has become a kind of rallying cry occupying about the same position that *the whole child* and *education for democratic living* have held in other times. More than any other term, it seems to reflect the new intellectual rigor which is supposed to be characteristic of such recent

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educational phenomena as the modern mathematics programs and the National Science Foundation's science curricula.

As with other slogans, one of the difficulties with *structure of the disciplines* is that there is some confusion as to what it means. *The Process of Education* was basically a conference report of fewer than 100 pages, less than a third of which was devoted to this topic. It was admittedly not intended to provide definitive answers, merely to state hypotheses. As a result, the problem of defining the term and resolving its implications was left open to debate and interpretation. In time, *structure of the disciplines* has been imbued with almost mystical qualities, and its stature as an educational slogan has grown, but its usefulness as an educational concept may have become somewhat obscured.

WHAT DOES IT MEAN?

The question of what is a discipline, and the question of what constitutes structure, have been central to the discussion of the new term. Several articles have been written, attempting the job of definition, which have either directly or implicitly expressed approval of Bruner's point of view *vis-a-vis* the problem-centered or directly functional approach to curriculum organization. One description ascribed to disciplines the properties of analytic simplification, synthetic coordination, and dynamism (8); another the characteristics of a domain, a methodology, and a history or tradition (4); and a third sees disciplines as having conceptual and syntactical dimensions (9). These analyses were intended, at least in part, to demonstrate that the organized intellectual resources we call disciplines possess certain attributes which uniquely qualify them for teaching and learning. Unfortunately, it is easy to misinterpret these statements as implying a kind of caste system in which certain fields can be placed in a more exalted position in the academic hierarchy than others. Characteristics which have been ascribed to disciplines are taken to be criteria which in effect qualify certain fields as *bona fide* disciplines and which serve to exclude others. Certain prestigious disciplines, like mathematics and physics, become paragons which other fields of study are to emulate. As a matter of fact, a considerable amount of speculation in educational circles has taken the form of agonizing over whether education itself qualifies as a discipline or whether it has to be assigned to some kind of academic limbo. The tendency has been to use the term *field of study* for areas like education which presumably do not possess the proper set of credentials,

and to reserve *discipline* for fields like mathematics and physics which are well established. One problem arising from such a distinction is that, by implication, disciplines are considered as entitled to a place in the curriculum, whereas fields of study are not.

Speculation about the term *structure* has sometimes involved the dissection of certain recognized disciplines with a view to exposing their elemental framework. This has occasionally taken the form of constructing models which are designed to illustrate graphically the complex interrelationships within a discipline. The assumption has been that once the superficial characteristics have been stripped away and the bare bones revealed, the problem of organizing the field for teaching purposes will become markedly simplified.

THE SIMPLE ORIGINS

By contrast, the examples which Bruner himself used to illustrate what he means by structure are simple and undramatic. The structure of biology, he says, may be seen through the "basic relation between external stimulation and locomotor action" to which concepts like tropism and explanations of the swarming of locusts can be related (3). In algebra, structure is related to the fundamental concepts of commutation, distribution, and association. Emphasis on these "three fundamentals" presumably will provide the basis for understanding a wide variety of algebraic operations. The structure of English involves "the subtle structure of a sentence" and the way in which variety can be introduced into the form of language without changing the meaning. Not only do Bruner's illustrations fail to suggest a kind of magical inner core of interrelated principles to which everything in that field may be related, but they all represent quite different orders of things. At one point, Bruner even suggests that structure may take the form of a kind of feeling of empathy or an ability to see parallels. Thus, in history, "If a student could grasp in its most human sense the weariness of Europe at the close of the Hundred Years' War and how it created the conditions for a workable but not ideologically absolute Treaty of Westphalia [sic], he might be better able to think about the ideological struggle of East and West-though the parallel is anything but exact" (3). According to Bruner, then, the structure of a discipline may include, but is not limited to, basic concepts, explanatory principles, generalizations, and insights. Much seems to depend on what kind of discipline it is, and to some extent, on one's individual perception of what is fundamental to that discipline. No one

would claim that historians, for example, are of one mind as to what *the* structure of history is or how history should be taught.'

None of Bruner's illustrations, therefore, implies that the disciplines are necessarily modeled around a skeleton of interrelated principles the general form of which is common to all disciplines and which must be relentlessly sought out and exposed before that subject can be properly taught. What does seem to be implied are two simple but important propositions: The first is that the curriculum ought to be organized around certain familiar subdivisions of knowledge, which Bruner chooses to call disciplines, and not around problems, social or personal. There is no suggestion, however, that any field of study must present an approved pedigree in order to be admitted to membership as a discipline. As a matter of fact, one important matter which Bruner leaves unresolved is the question of which subdivisions of knowledge are appropriate for study in the various stages of schooling and which should be excluded. The second proposition, implied by the word *structure*, is that the curriculum in these subjects ought to reflect what is central rather than what is peripheral to the fields. It is an attempt to avoid such obvious pitfalls in the teaching of subject matter as the mechanical manipulation of formulae in mathematics and the barren teaching of history as a congeries of unrelated dates and events. The problem of organizing a field for teaching and learning, then, is not one of searching for *the* structure and then transmitting it in *toto*, but one of determining which of the basic principles, theories, concepts, and the like can be adapted for this purpose.

IS IT USEFUL?

As an educational watchword, *structure of the disciplines* is certainly not without merit. The most obvious feature of the term is that it focuses the educational spotlight on knowledge in its various dimensions as the basic stock in trade of the schools. In the recent past, educationists have paid lip-service to the importance of knowledge as a fundamental factor in curriculum planning, but they have rarely given it the attention it deserves. The least that can be said is that *structure of the disciplines* may enliven

¹ Samuel Eliot Morison has recently criticized the approach to the teaching of history that was developed by Educational Services, Incorporated, an organization of academicians from Harvard and MIT. Recognizing that his views are outside the "Brunerian" frame of reference," Professor Morison nevertheless expressed a preference for the narrative tradition in history. Morison also confessed to some difficulty in understanding the aims of the group because their material was written "in 'pedagogy' idiom." Apparently the scholars who worked on the program developed fluency in that dialect as a byproduct of dealing with pedagogical problems (6).

the debate as to whether knowledge should be used instrumentally in the schools as a means of solving problems or whether it should be studied directly. Out of that debate a new consensus may eventually emerge, perhaps along the lines that Bellack has already suggested (1).

As has been noted, a second feature of the term is that it distinctly implies that in planning the curriculum around organized fields of knowledge, an effort must be made to emphasize what is fundamental to those fields and to minimize what is peripheral. This is not an unimportant consideration because there is reason to believe that a curriculum organized around subject-matter fields may lead to mechanistic teaching and learning unrelated to the kind of intellectual activity that characterizes the highest levels of scholarship. It is, however, not the first time that an effort has been made to plan a curriculum around what is basic to a field of study (2).

There are also some negative aspects to the way that *structure of the disciplines* has been interpreted and used, and if we are at all serious about the reevaluation of the curriculum which seems to be taking place, we ought at least to be aware of them. One of the obvious facts of life in curriculum planning is that not all of the subdivisions of knowledge can be incorporated into the curriculum. There simply is not enough time available, even assuming twelve years of schooling, to do this in any systematic kind of way. One is faced, then, with two basic alternatives: The first is to reorganize several subdivisions into broader units. This has been reasonably successful in certain instances and has met with undistinguished results in others. Botany, zoology, and physiology have been successfully combined and taught under the rubric of biology, but unresolved problems still plague the broad fields of social studies and English. The other alternative is simply to make choices from among the various disciplines, selecting those that seem more important than others.

SOME DANGERS

If we are to be guided by a narrow and limiting conception of *structure of the disciplines* in attempting to resolve this crucial problem, we would tend to exclude the first alternative out of hand because these broad fields have no stature as disciplines and would presumably lack well-defined structures. In considering the second alternative, our tendency would be to favor those fields of study that can readily exhibit a network of interrelated principles as their structure. While the existence of this kind of structure may make the curriculum in that subject in one sense easier to organize, its presence does not insure that that field of study is a more desirable component of a

program of general education than one that does not. If structure is interpreted this way, then the social sciences and the humanities would be relegated to a permanent position of inferiority to the natural sciences and mathematics. The danger is that the question of *how* the curriculum shall be organized will become confused with the question of *what* shall be taught.

A second danger associated with the concept of *structure of the disciplines* is that so much attention will be directed to internal investigation of each of the fields of study that the curriculum as a whole will receive only superficial consideration. The curriculum generalist, the person who is concerned with the curriculum from a broad perspective, is rarely a participant in those commissions which have sought to develop programs in the individual subject areas and have been identified with the *structure of the disciplines* point of view. As a result, there has been little attention given to questions of balance and integration in the curriculum broadly conceived. A program of general education, after all, is not a collection of independent studies. It is (or at least people try to make it) an approximation of what it is important to know.

There are signs already that this critical question may reduce itself to a power struggle among the various disciplines and will be decided on such factors as which discipline can gain enough federal and foundational support to secure a foothold in the curricula of American schools. The American Anthropological Association, for example, has succeeded in acquiring financial support from the National Science Foundation and is seeking a place for anthropology in the high-school curriculum. No major support has been forthcoming, however, for the claims of astronomy, psychology, social psychology, and philosophy. Few people would conceive of this as a desirable situation. It seems to be occurring, however, as a byproduct of an extraordinary emphasis on the curriculum in individual subject fields and a corresponding lack of attention to how all of the parts fit together.

The third danger implicit in some of the proposals associated with the *structure of the disciplines* is perhaps the most subtle. It is that schooling and the world of affairs will become even more sharply disjoined than is already the case as part of an unwholesome fission between theory and practice. This, of course, is a recurring and complex problem. It has become particularly acute, however, as a result of the tendency on the part of academicians who have been developing courses of study in the various disciplines in effect to interpret structure almost exclusively in terms of theory. An academician's bias is almost inevitably toward theoretical concerns because theory frequently represents the crowning accomplish-

ment in his field. This does *not* mean that theory ought to dominate every stage of instruction. This criticism is not intended to resurrect the old cry of "subject-matter specialist" once again as a term of opprobrium. It does recognize that a scholar's commitment to his discipline and his expertise in that field are not the only qualifications that are appropriate to planning a curriculum. It is a little late in the day to argue that the academician has no place in the development of courses of study, but it is quite another thing to hold these scholars in such awe as to preclude a useful dialogue among educationists and academicians mutually concerned with school programs.

THE ISSUE OF RELEVANCE

Paradoxically, it was a professor of physics who, in a recent interview, made the overemphasis on theory a focal point of what is perhaps the sharpest attack on some of the new "structured" courses in the sciences and mathematics. Referring to these new curricula as a form of "educational carpet baggery" and to the superintendents and school boards who implement them as "scalawags," Professor Calandra directed much of his criticism at what he considers to be a decided overemphasis on theory in programs like the ones sponsored by PSSC and CBA and an "unfortunate divorce of pure mathematics from applied mathematics" in the new mathematics programs (7). Over-emphasis on theoretical abstractions and the creation of a dichotomy between theory and practice, in turn, may serve to obscure the relevance of schooling to the world of affairs. It is at least possible that intensive and continuous stress on theory will, in the mind of the student, remove that discipline from the arena of human activity out of which it arose. Structure, when equated with theory, can contribute to that unfortunate detachment.

It should be obvious that none of the dangers enumerated here is a *necessary* concomitant of *structure of the disciplines* as an educational slogan. As a matter of fact, several of the programs which are now identified with that term were under way before the publication of *The Process of Education*. Nevertheless, the phrase seems to capture the tenor of much of what has been done in the name of the new academic excellence and is presently very much in vogue. Its effect, however, is difficult to assess. On the one hand, the term has served to stimulate novel curriculum thinking and sharpen debate on certain issues; on the other, it has generated some complex problems. Each of these problems poses a potential obstacle to the development of a coherent and effective program

for our schools. On balance, one must conclude that the recent emphasis on *structure of the disciplines* as the cornerstone of curriculum planning is a rather mixed blessing.

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LOGIC, THINKING, AND TEACHING

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My purpose is to explore the proposition that logic is relevant to thinking and teaching, and that preparation of the teacher should include the study of what I shall call educational logic. I shall discuss three points: First, that in the course of separating psychology from philosophy, the logical basis of education was lost in the shuffle and that in consequence pedagogical thought became psychologized; second, that the reduction of thinking to psychological processes left us without an adequate criterion of disciplined reasoning and that such a criterion is to be found in logic; third, in order to give rigor to the educative process the teacher must himself have command of logic, and that therefore, teaching depends as much upon logic as it does upon psychology.

LOGIC AND PSYCHOLOGY

At the outset I wish to say that by logic I mean inductive and deductive logic and along with it, semantics in its descriptive and philosophic sense. Logic is neither thinking nor thought. It has nothing to do with the creative processes. It does not tell us how we in fact do think, nor does it tell us how we ought to think. It is not a set of laws to be imposed upon thinking. It simply gives us the rules and techniques by which to assess the results of our mental efforts.

It is easy to see from what I have said that I hold logic and psychology to be different subjects. This view is out of step with that generally held in pragmatic educational theory wherein psychology and logic are meshed together to form a theory of problem solving. It conflicts also with the main line of the empiricist tradition stemming from Locke and Hume, which until about fifty years ago, held that logic and psychology were merely different ways of talking about the same thing. Logic supposedly described the processes of thinking; that is, the rules of logic were thought to be laws describing the way thinking actually occurred. Psychology as the