

## History of the Term "The Structure of Disciplines"

Matthew Meisterheim's article in the December, 1969 issue of *The Journal* ("Structure of the Disciplines and History") stating that the term "structure" has been popularized through Jerome Bruner's book *The Process of Education* is indeed a generally accepted view. Meisterheim did, however, include the possibility that Bruner might not have coined the term although the author could find no references to structure predating the 1959 Woods Hole Conference.

The purpose of this article is to examine numerous instances in which both the term "structure" was used well in advance of the conference from which grew *The Process of Education* and to note past educational and philosophical statements which stressed essentially the same position incorporated in the Bruner thesis. This is, however, not meant as an exercise to detract from Bruner's contribution to educational theory.

Three related concepts will be examined: (1) the position that each discipline has a structure unto itself and so can be identified by this characteristic, and particularly by its method of inquiry; (2) such structure is essential in conceptualizing a body of knowledge and in establishing relationships among the many facets of a body of knowledge;\* (3) a "spiral curriculum" makes it possible for structure to be presented to the student again and again, each time in a more sophisticated form until the student might well reach the frontier of knowledge.

### *Conceptual Structure*

One does not need to venture far from Bruner's habitat in order to find a statement peculiarly akin to his position. Burrhus Skinner, the current *pater patriae* of those stating educational aims in behavioral terms and Bruner's colleague at Harvard, not only described his system in disciplinary terms but also used the term "structure". *The Behavior of Organisms*, a 1938 account of experiments with pigeons in the "Skinner box" described the laws of operant and respondent behavior and at the outset Skinner asked the question, "What will be the structure of a science of behavior?"<sup>1</sup> The question was again raised in connection with a discussion of the relative merits of topographical description versus experimental investigation for a method of inquiry in the field of behavior. Skinner's conclusion in this thirty-year-old work is that experimental investigation (the method of inquiry) will yield results compatible with the discipline, or as Skinner says: "The principle advantage . . . lies in obtaining a

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\*This view of the expert can, however, be presented to any child at any stage of development provided it is matched to the level and ability of the child.

<sup>1</sup>Burrhus F. Skinner, *The Behavior of Organisms* (New York: Appleton-Century-Crofts, 1938), p. 5.

system of behavior which has a structure determined by the nature of the subject matter itself."<sup>2</sup>

Essays written in honor of Harvard's Professor Henry Sheffer also recognized that the areas of knowledge were most effectively identified by noting the methods used in their respective inquiries. Kaiser notes that "it is not necessary to distinguish between the questions, 'What is the method of this discipline?' and 'What is this discipline?' If we know that the discipline is an activity and we know how it is carried on, we know what it is."<sup>3</sup> Weiner, in the same book, *Structure Method and Meaning*, noted that in early civilization mathematics was considered a separate discipline based upon a recognition of its own internal logical laws.<sup>4</sup>

In *Die Natürliche Ordnung Unserers Denkens*, published in 1927, Ludwig Fischer dealt with *wesen*, the essence of fields of knowledge. Translated in 1931 as *The Structure of Thought*, the author approached knowledge as a whole, isolating particular regions by use of a set of axioms which were carefully selected so that "the analysis of the structure, without the extraneous help of any other concepts, suffices to give us a derivation of the whole region which, within any given science, it is desired to comprehend and to order."<sup>5</sup>

It was Ernst Cassirer, however, who delved most thoroughly into the history of discipline identification. His three-volume work, *Philosophy of Symbolic Forms* and his *Essay on Man* deal with the metaphysical question of the unity of knowledge and so examined the problems inherent in the division of knowledge into subject fields. In these works there are numerous historical references to this subject but Cassirer's main contribution to the history of structure is contained in *The Logic of the Humanities*, published in 1960 but written sometime before 1945. The author noted that Vico believed that only the works of human civilization are open to complete knowledge by man for only in these areas is the "inner structure" "open to the human mind because the human mind is its creator."<sup>6</sup> Vico's logic gave definition to the humanities, an area more difficult to demarcate than the more readily structured fields of science and mathematics. While Herder also investigated the nature of the humanities, Cassirer noted that Kant dealt with a structured analysis of the natural sciences rather than of *Kulturwissenschaften* and in the *Critique of Judgement*, "probes for the fundamental concepts which make

<sup>2</sup>*Ibid.*, p. 434.

<sup>3</sup>C. Hillis Kaiser, "The Method of Methodology," *Structure Method and Meaning* (New York: The Liberal Arts Press, 1951), p. 152.

<sup>4</sup>Norbert Wiener, "Pure and Applied Mathematics," *Structure Method and Meaning* (New York: The Liberal Arts Press, 1951), p. 91.

<sup>5</sup>Ludwig Fischer, *The Structure of Thought* (London: George Allen & Unwin Ltd., 1931), p. 10.

<sup>6</sup>Ernst Cassirer, *The Logic of the Humanities* (New Haven: Yale University Press, 1960), p. 53.

knowledge possible.”<sup>7</sup> The author concludes that it was through the epistemological efforts of philosophers that scholars were successful in “erecting the structure of scientific knowledge.”<sup>8</sup>

The tradition which produced such statements is a long and rich field of observation and speculation. King notes that Aristotle in *Nichomachean Ethics* and *Metaphysics* says that the organization of knowledge is based upon the end of the disciplines and the nature of the matter on which they work.<sup>9</sup> Mursell also drew upon such philosophic treatises in defense of his theory of knowledge and his thesis can be traced to his analysis of the works of Descartes. As a youth, Descartes became disillusioned with the trappings that were the mark of an educated man and in his *Discourse on the Method* states that “the ground of our opinion is far more custom and example than any certain knowledge.” At twenty-three years of age he felt he was too young to attempt to find general truths and so, as described in the *Regulae*, Descartes set forth to apply his method to another field. The well known result — analytic geometry — was from the application of his epistemological method for isolating essential natures and yielded the *quaestio* of the curve. Furthermore, at the end of the second book of his *Principia*, order is seen to be the essence of both physics and mathematics. The ability to apprehend such basic structures, Descartes termed “intuition” which is the method of the expert investigator and is always directed at simple essences.<sup>11</sup>

King follows such a concept through Kant who believed that each discipline is a “clear cut separate system based upon a regulative idea and marked by a mode of inquiry. Consequently, modes of inquiry vary with disciplines.”<sup>12</sup>

### *Early Intellectual Honesty*

Bruner so firmly believed in the importance of apprehending the structure of a discipline that he, in an oft-quoted statement, advocated that “. . . any subject can be taught effectively in some intellectually honest form to any child at any stage of development.”<sup>13</sup> The beginner should be concerned with the same *kinds* of processes and regards as the expert investigator or scholar working on the frontier of knowledge and as such

<sup>7</sup>*Ibid.*, p. 62.

<sup>8</sup>Ernst Cassirer, *The Problem of Knowledge* (New Haven: Yale University Press, 1950), p. 38.

<sup>9</sup>Arthur R. King and John A. Brownell, *The Curriculum and the Disciplines of Knowledge* (New York: John Wiley & Sons Inc., 1966), p. 42.

<sup>10</sup>Descartes, “Discourse on the Method of Rightly Conducting the Reason and Seeking the Truth in the Sciences,” *The Harvard Classics*, Volume 34 (New York: P. F. Collier & Son Corporates, 1938), p. 16.

<sup>11</sup>James L. Mursell, “The Concept of Intuition in Descartes’ Philosophy of Science,” *Philosophical Review*, XXVIII (July, 1919), p. 398.

<sup>12</sup>King, *op. cit.*, p. 46.

<sup>13</sup>Jerome Bruner, *The Process of Education* (Cambridge: Harvard University Press, 1960), p. 33.

should be introduced to those concepts which constitute the structure of a discipline. The neophyte scientist should have the same general concerns as an Enrico Fermi, the budding pianist the same musical goals as a Rubenstein.

Mursell, in *Developmental Teaching* (1949), stated essentially the same position in noting that "a little child . . . should begin the study of any subject matter with exactly the same kind of processes that are exemplified in the work of the greatest experts, although the difference in organization and efficiency is enormous."<sup>14</sup> Some years earlier, in a speech to the Ohio Education Association, he attacked the problem of "What is Progressive Music Education?" and in February, 1932 stated, "There may be a vast difference in degree between the musical mentality of the little child in the first grade and that of the great artist, but if the child is being rightly taught, *there should be no difference in kind.*"<sup>15</sup>

What Mursell had previously called essence was, in 1946, referred to as the "key or clue" or the process of the expert which should be sought at all levels of attainment. In describing instances of successful projects carried on in a third grade class, Mursell noted that in each case the fundamental modes of operation of a discipline were revealed. He concluded, "If one wishes to think competently about nature, one must think as the scientist thinks. If one wishes to think competently about society, one must use categories and techniques of the social scientist. If one wishes to understand the past, one must see it from the viewpoint of the historian."<sup>16</sup>

This was a unique view although not an altogether uncommon one and similar statements can be noted in other works. Essentially they were a reaction against mechanistic teaching which often stressed the externals of a subject, neglecting the essentials, spirit, or inner structure of a discipline. Humanistic psychology too made contributions to the idea of getting across to the child as early as possible the "flavor" of a field of knowledge. Revesz, Stout, Ward, and other European psychologists were making such statements and Koffka's *The Growth of the Mind: An Introduction to Child Psychology* introduced holistic or gestalt principles to teaching and learning. These ideas were on a collision course with the incremental S-R Thorndike theory and the result was a crash program of progressive education. Such men as Kilpatrick, and even Dewey eventually had to criticize the behavior-based theory. Kilpatrick, particularly, had to revise his lectures and publications in order to take note of the fact that one learns most effectively by approaching a subject through

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<sup>14</sup>James L. Mursell, *Developmental Teaching* (New York: McGraw-Hill, 1949), p. 31.

<sup>15</sup>James L. Mursell, "Progressive Music Education," *Ohio Schools*, X (November, 1932), p. 295.

<sup>16</sup>James L. Mursell, *Successful Teaching: Its Psychological Principles* (New York: McGraw-Hill, 1946), p. 110.

its major essence, subsequently analyzing and resynthesizing the constituent elements.

### *Spiral Curriculum*

Bruner's "spiral curriculum" is a part of *The Process of Education* that is seldom noted although it is a description of the general method for teaching structure. The central focus, the essence of a discipline, Bruner recommended, is to be presented, developed and redeveloped with a continuous movement toward more complex issues.<sup>17</sup> If then, mathematical ability and knowledge is viewed as thinking in relationships, this is to be the central theme of such teaching whether it concerns itself with the distribution of crayons or the investigation of vectors and becomes a recurring spiral with ever widening scope, heightened understanding and yet firmly based upon a controlling principle.

Mursell, in what he termed a "cyclical approach" made use of similar principles in his book *Developmental Teaching* (1949) in which the essence of subject matter was defined and continually stressed in various settings. This central concern is to be introduced at the youngest possible age, redefined, and nurtured in a recurring cycle of synthesis, analysis, and resynthesis. Because a subject field is approached in its entirety (as far as structure is concerned) there is no process of addition, rather, the discipline is encouraged to "develop".

Bruner stands at the apex of a long and distinguished group of philosophers, psychologists, and educational theorists who have sought to define and isolate the essential elements in fields of knowledge so that the process of education might be rendered more efficient. Certain of these in the continuum have been noted and yet others of equal or greater importance are probably still to be recognized. This might well be a fertile and revealing area for a comprehensive historical study.

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<sup>17</sup>Bruner, *op. cit.*, p. 54.