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ABSTRACT

This critique of three Piaget-based curricula presents the argument that it is essential for early childhood educators to distinguish between the actual contributions of Piaget in regard to specific epistemological questions and the way these contributions have been reinterpreted to provide a basis for early childhood curriculum reform. The critique focuses on the dual aspects of interpretation and application for the three programs analyzed: (1) David Weikart's Cognitively Oriented Curriculum; (2) Celia S. Lavatelli's Early Childhood Curriculum: A Piaget Approach; and (3) Constance Kamii's and Rheta DeVries' Piaget for Early Education. Piaget's epistemology is reviewed with reference to his views on the nature of subject-object relationship, the construction of operations, the nature of physical and logico-mathematical knowledge, and the representation of knowledge. Each of the three curricula is analyzed according to these epistemological foundations. (ED)

Will The Real Jean Piaget Please Stand Up:

An Epistemological Critique of Three Piaget-Based Early Childhood Curricula

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Will The Real Jean Piaget Please Stand Up: An Epistemological Critique of Three Piaget-Based Early Childhood Curricula

Introduction

During the past few years, the name Piaget has become the "Good Housekeeping Seal of Approval" for a number of preschool curricula and innovations in classroom organization (Lavatelli, 1970; Weikart, et. at., 1971; Furth and Wachs, 1974; Kamii and DeVries, 1975). The "American" Piaget has been constructed by early childhood educators to provide a psychological rationale that seems to be relevant to contemporary educational trends. His work has been dissected, digested, and assimilated in this country to fit the traditional mold of American education. Typically this psychological rationale includes the notion of stages, the use of concrete and manipulative objects, the learner as an active organism, and the acquisition of specific logical-mathematical concepts.

In any discussion of Piaget and the field of education, it is essential to realize that Piaget is an epistemologist and as such is primarily concerned with the nature and acquisition of knowledge. As an epistemologist, Piaget has directed his research toward an elucidation of two basic questions: What is the nature of knowledge, and how does Man come to know? In a previous paper (Kaufman and Konicek, 1974), it was argued that the Piagetian theory concerning the nature of knowledge and how Man acquires knowledge has little applicability to contemporary education. It was suggested that the empiricist tradition of schooling was mutually exclusive to the constructivist epistemology formulated by Piaget.

To design early childhood programs within Piaget's psychological perspective, limits the revolutionary nature of the theory and can only result in gross misinter-

pretations and misapplications. Piaget's psychological perspective provides unique insight into the developmental nature of cognitive functioning, however if the Piagetian rationale is to have any direct bearing on curriculum reform in early education, it must be through an epistemological framework. In reference to this orientation, Furth (1969) has indicated that ". . . revolutionary changes in the whole field of education and human relations seem to be a direct consequence of a deeper understanding of Piaget's theory. Who dares to guess how our primary education would change if teachers really took seriously Piaget's proposition that knowledge is an operation that constructs its objects?" (pp. 7).

It is essential that early childhood educators make the distinction between the actual contributions of Piaget in regard to specific epistemological questions and how these contributions have been reinterpreted to provide a basis for what appears to be relevant in the area of early childhood curriculum reform. To this end, the following study will critique three Piaget-based programs to ascertain the degree they reflect the epistemological foundations of Piaget. The critique will focus on the dual aspects of interpretation and application. The programs analyzed are: (1) David Weikart's Cognitively Oriented Curriculum, (2) Celia S. Lavatelli's Early Childhood Curriculum: A Piaget Approach, and (3) Constance Kamii and Rheta DeVries' Piaget for Early Education.

Piaget's Epistemology

1. Subject - object relationship:

Central to Piaget's theory of knowledge is the relationship between the subject and the object, or the organism and the environment. Deeply rooted in a biological perspective, Piaget's theory is "essentially a theory of adaptation of thoughts to reality, even if this adaptation at last reveals, as does every adaptation, the existence of an inextricable interaction between subjects and objects." (1968, pp. 24) Viewing knowledge as a biological adaptation, the epistemology of

Piaget rejects any form of subject-object dualism. For Piaget (1970a) "knowledge . . . neither arises from objects nor from the subject, but from interactions . . . between the subject and those objects."(pp 704) The theory of knowledge posited by Piaget (1970a) reduces itself to "analyzing how the subject becomes progressively able to know objects adequately, that is, how he becomes capable of objectivity."(pp. 704)

Piaget rejects the dualistic perspective found in empiricism and rationalism. The empiricist epistemology (Locke, Berkely, Hume, and the Vienna Circle) views knowledge as external to the subject and objectivity is simply the result of perceptual data, linguistic labels and motoric associations. Such an epistemological perspective produces what Piaget terms a figurative copy of objects. Figurative copies of objects are merely imitation of states and are therefore static in nature. Within the empiricist view, the "function of intelligence is systematically to file, correct, etc., these various sets of information . . ." (Piaget 1970, pp. 703)

The rationalist epistemology (Descartes, Kant, Chomsky, and Freud) posits a view of knowledge that is innate in Man consisting of an unfolding of structures preformed within the subject. According to the rationalist perspective "the 'categories' of knowledge are biologically preformed as the antecedent conditions of all experience . . ." (Piaget 1972, pp. 56) Apriorism allows the organism to respond to every situation by actualizing its potential structures. The rationalist epistemology views knowledge as preformed and becomes manifest in the course of maturational development.

The Piagetian epistemological perspective sees the genesis of knowledge neither in objects nor from subjects but from interactions between the two. In order to know objects, the subject must act upon them and transform them. In every action the subject and the objects are joined. A transformation consists of actions that displace, connect, combine, take apart and reassemble objects.

> To my way of thinking, knowing an object does not mean copying it -- it means acting upon it. It means constructing systems of transformations that can be carried out on or with this object. Knowing reality means constructing systems of transformations that can be carried out on or with the object.... The transformational structures on which knowledge consists are not copies of the transformations in reality; they are simply possible isomorphic models among which experience can enable us to choose. Knowledge, then, is a system of transformations that become progressively adequate.(Piaget 1970b, pp. 15)

2. Knowledge as a Construction:

During his lifetime, Piaget has primarily been concerned with a single, yet global epistemological question: What is the nature of knowledge? As previously stated, the Piagetian epistemology does not view the genesis of knowledge in objects or in subjects, but from an inextricable interaction between the two. The natural consequence of this interaction is an individual's construction of knowledge. The construction of knowledge is a biological oriented process where a subject evolves his own objective sense of reality. Objectivity is not an initial property, but is invented by the subject. Therefore objectivity is highly individualistic and relativistic; not as the empiricists believe a faithful copy of reality.

Since objective knowledge is not acquired by perceptual recordings of external data but has its genesis in interactions, Piaget posits two types of activity in the construction of knowledge: (a) the coordination of actions, and (b) the interrelations between objects. The two activities are interdependent and it is through action that the relations originate. The structures of action are constructed "and are not given in objects, since they are dependent on action, nor in the subject, since the subject must learn how to coordinate his actions. (Piaget 1970a, pp. 704)

Central to the Piagetian epistemology of constructivism is the notion of the action or operation. In this context, knowledge is not obtained from objects but from the action itself.

> The living organism itself is not a mere mirror image of the properties of its environment. It evolves a structure which is constructed step by step in the course of epigenesis, and which is not entirely preformed. (Piaget 1970a, pp. 705)

Unless the subject has acted on objects and internalized his action, he has not constructed knowledge. Piaget, as previously indicated, makes a distinction between two types of actions. The first of these actions consist primarily of sensorimotor activities such as pushing, pulling, or touching. These individual actions give rise to what Piaget terms figurative aspects of knowing. Figurative knowledge is momentary and static. The second type of action is based on interiorized coordinated actions and are termed operations.

Operations can be coordinated in a number of different ways. They can be joined together in an additive coordination. They can be sequenced in a temporal order to form an ordinal coordination. A coordination can be established among actions or between one action or another. A final coordination is the establishment of intersections among actions. The root of all logical thought is to be found in the coordination of actions and form the basis of reflective abstraction. The genesis of logical thinking is constructed by the subject and are to be found in the actions of the subject and more specifically in the coordination of his actions.

Summarizing the constructionalist notion of knowledge, Piaget (1970b) states:

> . . . knowledge results from continuous construction, since in each act of understanding, some degree of invention is involved; in development, the passage from one stage to the next is always characterized by the formation of new structures which did not exist before, either in the external world or in the subject's mind. (pp. 77)

3. Types of Knowledge:

Piaget identifies two types of knowledge: physical knowledge and logico-mathematical knowledge. Physical knowledge is abstracted by the subject from

objects themselves. For example, a child can lift objects in his hand and realize they have different weights. He finds this out experientially, and his knowledge is extracted from the objects. It is the physical experience that allows the child to discover weight. Physical knowledge gives rise to figurative aspects of thinking, because the subject attempts to represent reality as it appears without transforming it.

Logico-mathematical knowledge is derived from the knowing activity itself and therefore is constructed by the subject. In logico-mathematical knowledge, the subject reflects on its own coordinating activity to give rise to what Piaget terms reflective abstraction. Reflective abstraction is a dialectical process consisting of an internal feedback mechanism where the subject reflects on its own coordinating activity in a self-regulatory sense. The reflecting is not an introspective process, but an active coordinated system of actions that progressively enriches the internal structure. Piaget notes (1970a)

> . . . we can speak of logico-mathematical experiments, which extract information from the properties of actions applied to objects, and not from the objects themselves. . . (pp. 728)

In reflective abstraction, the subject abstracts logical relationships among objects. For example, if a child lifts objects each of a different weight, physical knowledge can be abstracted to allow the child to indicate the heaviest. However to have the child place the objects in a serial relationship from the heaviest to the lightest requires reflective abstraction, i.e. ordering relationships are not to be found in the objects themselves but must be constructed by the child as a result of his coordinated actions. The serial relationship is a form of logico-mathematical knowledge and is constructed by the child; not from the physical knowledge of the objects.

The revolutionary aspect of Piaget's epistemological notion of logico-mathematical knowledge rests in the fact that such knowledge is not directly teachable because it is constructed out of reflective abstraction giving rise to

object relationships the subject has invented himself. It is extremely difficult for those of us schooled in an empiricist tradition, but the Piagetian epistemology related to the genisis of logico-mathematical knowledge clearly supports the notion that no one taught us how to perform arithmatic operations or even the class inclusion relationship necessary to understand the nature of a state to a state capital. Every logico-mathematical relationship is constructed and every subsequent relationship is a relationship among relationships. The process of forming such relationships is reflective abstraction. Because Piaget views the process of reflective abstraction as any biological function, all normal children will acquire logico-mathematical knowledge without the need of didactic teaching. Once acquired, logico-mathematical knowledge becomes part of the subject and therefore cannot be forgotten but only used as additional structures for future reflective abstraction in the formation of new logico-mathematical knowledge.

4.. Representation of Knowledge:

To obtain a complete picture of Piaget's epistemological foundation it is essential to examine how knowledge is represented in the form of symbolic functioning. For Piaget, the operative aspects by which the subject constructs logico-mathematical knowledge and the symbolic process by which the subject re-represents actions are functionally different.

To comprehend Piaget's position on symbolic representation, one must understand the dual notions of signifier and significate. A signifier is any object or event within a subject-object interaction that provides some knowledge to the subject about another object or event. A signifier is an object or event that is beyond itself. The event or object which the signifier provides information is termed a significate. The relationship of signifier to the significate is its signification.

Perhaps an example would be helpful in distinguishing signifier and significate. A young child sees his father turning on the hot water in the bathroom and says, "Daddy going to shave?" The father replies, "No, I am running the water to wash my hands." The hot running water is the signifier. The act of shaving is the significate. The relationship of the hot running water (signifier) to the father shaving (significate) is the signification.

Piaget indicates three types of signifiers. The first is termed an index. An index representation is a signifier that is not differentiated from their significate because they are part of them or causally related. For example, a child hearing a dog bark is an index representation of a dog (barking is the signifier for the significate dog).

The second signifier is termed a symbol. A symbol is differentiated from their significate, but retain a degree of similarity to them. Symbolic representation is the subject's ability to construct a symbol for representing that which the subject knows and yet is not present. For example, in symbolic play, a child represents an airplane with a pencil. The pencil (signifier) is symbolically representing an airplaine (significate). Symbolic representation presupposes the constructive activity of an interiorized coordination of actions or operational thinking.

The third signifier is termed a sign. A sign is also differentiated from their significates but are conventional and often arbitrary. Signs are therefore always social. Piaget restricts the meaning of the term sign to linguistic or other agreed upon representations. For example, the letters C A T is a sign (signifier) for the object cat (significant).

The symbol and sign levels of representation Piaget terms semiotic functions. Semiotic functions are the ability to represent objects or events which are absent, i.e., signifiers differentiated from their significates. Semiotic functions include play, images, imitation, and language. Index levels of representation are

figurative in nature, whereas semiotic functions (symbols and signs) are operational.

Perhaps the most central issue related to Piaget's epistemology in the area of representative functioning is that he does not see language as a necessary element of operational thinking. Language for Piaget is acquired and used like any other semiotic function and is only a manifestation of sign behavior. Furth (1969) states:

> The formation of thinking as conceptual "representation" assuredly goes hand and hand in the child with the acquisition of language; but one should not see in conceptual representation a simple causal result of language, for both processes are linked to a more general process which is the symbolic (semiotic) function. In fact, language appears at the same level of development as symbolic play, deferred imitation, and probably the mental image insofar as it is internalized imitation. The characteristic of the symbolic (semiotic) function in its various aspects is the differentiation of signifiers and significates, and the capacity to evoke, by means of these differentiated signifiers, significates that are not actually perceived. These two characteristics oppose verbal signs and the symbols used in play, gesture, or images to sensory-motor indices, or signals that are not differentiated from their significates and therefore cannot evoke objects or events not actually perceived. The transition between sensory-motor behavior and symbolic or representational behavior is probably tied to the presence of imitation. . . . It is noteworthy that language is acquired in a context of imitation and this imitative factor seems to constitute an essential support. If language acquisition were only due to conditioning it should take place at a much earlier age. But if the development of imitation is itself linked to the development of intelligent behavior in its totality, it is apparent that one can legitimately consider language as playing a central role in the formation of thinking only insofar as language is one of the manifestations of symbolic (semiotic) function. The development of the symbolic (semiotic) function in turn is dominated by intelligence in its total functioning. (pp. 126)

An Epistemological Critique of Three Piaget-Based Early Childhood Curricula

Evans (1975), and Kammi and DeVries (1973) have provided critiques of Piaget-based early education programs. As Evans indicates, data bout measurable outcomes of Piaget-based early childhood curricula is sparse. What evidence does exist is primarily evaluatory in nature and was conducted by the model builders.

Consequently, the available critiques are mainly conceptual arguments that focus on the psychological and pedagogical aspects of the program.

The following critique will be an epistemological analysis of three Piaget-based early childhood education curricula. Each program will be critiqued according to the following Piagetian epistemological foundations previously discussed:

1. The nature of subject-object relationship
2. The construction of operations
3. The nature of physical and logico-mathematical knowledge
4. The representation of knowledge

The psychological perspective of Piaget's theory - stages of development, and equilibration - will not be used as a basis for the critique. It is clear that the psychological significance of Piaget's theory is a point of general agreement among all three curricula. All model builders agree that the pre-school child is in the stage of pre-operations and exhibits the basic pre-operational characteristics described by Piaget (1967). Other points of psychological agreement focuses on the value of play to cognition, the need for unstructed learning opportunities, the notion that telling is not teaching, the critical role of mental activity, and the active involvement of the child in learning.

As previously indicated, the real power of Piaget's theory lies not in the psychological perspective for which there is general agreement, but rather in the epistemological foundations. An early education curriculum should be internally consistant in its epistemology, psychology, and pedagogy. Misinterpretations in the epistemological foundations will certainly lead to misapplications on the pedagogical level.

Celia S. Lavatelli's Early Childhood Curriculum: A Piaget Approach

The source for the critique of Lavaatelli's curriculum will be the companion text for the program - Piaget's Theory Applied to an Early Childhood Curriculum (1970)

1. The Nature of Subject-Object Relationship:

Within an epistemological framework, it is clear that Lavatelli's program does not view the child in unity with his environment. Many of the activities and directions provided by the teacher reflect an empiricist epistemology in which the genesis of knowledge is to be found in objects.

> No daily ten minutes period of mental gymnastics is going to work miracles in developing intellectual competence, but when the teacher knows how to reinforce (underlining for emphasis) the directed periods throughout the day . . . she increases the likelihood that generalization of the concep[illegible]cur and transfer of training will be possible. (pp. 47)

The terms reinforce, generalization and transfer of training are behaviorist in orientation and seem to reflect Thorndike's Law of Effect rather than Piaget's notion of subject-object unity.

The Lavatelli curriculum is a packaged program broken down into three components: (1) classification, (2) number, measurement, and space, and (3) seriation. All of the activities related to these components are highly structured and does not permit for the transformation of objects. Lavatelli labels the learning opporunities for the curriculum a "training program" and this is exactly what it is - a training program with little opporunity for the children to construct a system of transformations on the objects. Although Lavatelli provides a strong argument that training in perceptual skills will not lead to logical thinking, practically the entire curriculum is based on figurative knowing with little evidence for the child to engage in operational thinking.

2. The Construction of Operations:

Within the Piagetian epistemology, unless the child has acted on objects and internalized his actions, he has not constructed knowledge. Operations are always internal and not an external function. Any external manifestation of an operation is a unique and specific act and does not represent the totality of an operation. An operation is a thinking action constructed by the child and not

subject to empirical verification.

All of Lavatelli's program is based on empiricist assumptions about the acquisition of an operation. The program recommends giving verbal rules, having the child give the correct answer, strong teacher direction, and providing for teacher modeling behavior (pp. 88-93). The entire package misinterprets the heart of Piaget's epistemological notion of the construction of an operation.

3. The Nature of Physical and Logico-Mathematical Knowledge:

Although the Lavatelli curriculum focuses on the acquisition of certain mathematical concepts, they do not reflect Piaget's epistemological notion of logico-mathematical knowledge. A critical examination of the program will reveal that the overriding objective is one of attempting to teach operations such as classification, spacial relationships, or seriation. For example, in the Lavatelli program, teachers are instructed that the children learn through self-activity and the manipulation of objects (pp. 43). Few would argue with this basic Piagetian psychological principle, however on an epistemological level it assumes an empiricist view that children absorb logico-mathematical knowledge through their manipulations. It should be recalled that logico-mathematical knowledge is derived from the knowing act itself and not from the manipulation of objects. What is actually taking place in the Lavatelli program is the acquisition of "concepts" and not logico-mathematical knowledge.

On pages 93-95, Lavatelli speaks of the all-some relation found in the operation of classification. The training program related to class inclusion "is to have children carry out many activities where they combine subclasses to make a class and break a class down into its subclasses." (pp. 94) In such a class inclusion activity, whether there are more of a subclass or the class itself cannot be determined by observation or manipulation. The objects exist but the relationship of all to some exist in the child's mind. The child structures the class relationship by reflective abstraction and not from the

objects. Logico-mathematical knowledge is structured by reflective abstraction; not through manipulation.

Lavatelli emphasizes that the teachers should provide direct feedback and the making of models for the children to copy (pp. 88-89). In logico-mathematical knowledge, the teacher should instead facilitate reflective abstraction. If the teacher imposes his authority to provide feedback in a logical relationship, the child has not invented for himself and therefore does not encourage reflective abstraction. What the child is learning in such a situation is social conformity and prevents what Duckworth (1972) terms the "having of wonderful ideas."

4. The Representation of Knowledge:

The singularly most important component of the Lavatelli program that is in total opposition to Piaget's epistemological foundation is in the area of language development and the growth of logical intelligence. In all of chapter 3 (pp. 53-78), Lavatelli attempts to build a rationale for language training and intellectual competence that is consistant with Piaget's view of language development.

Lavatelli draws upon the research of Vygotsky, Bellugi, and Bernstein to support her position that language development can make children better thinkers. A critical examination of Vygotsky's (1962) position on language and thought reveals it is in opposition to Piaget's epistemology. Vygotsky states:

> He (the child) has the concept but is not conscious of own act of thought. The development of a scientific concept, on the other hand, usually begins with its verbal definition and its use in non-spontaneous operations . . . (pp. 108)

For Piaget, language is one of number of semiotic functions (imitation, play, or images). Logical thinking occurs in children without language and is only represented by various semiotic functions. The decisive argument against

the position that logico-mathematical structures are derived uniquely from linguistic forms is that in the course of intellectual development in any given individual, logico-mathematical structures exist before the appearance of language. Logico-mathematical knowledge have their genesis in actions and actions can be represented in a number of different ways, of which language is only one. It is Piaget's basic contention that logico-mathematical knowledge give rise to semiotic functions, and not vice versa.

Lavatelli draws heavily from the research of Bellugi to identify the syntactical and semantic forms that are necessary to help children form logical thinking patterns. Lavatelli indicates that teachers should deliberately model the correct syntax and encourage the child to use it. What Lavatelli fails to realize is that a child's syntactical structure is not a reflection of the child's logical thinking. The logic of action proceeds any semiotic function and therefore is not an indication of how a child is thinking.

David Weikart's Cognitively Oriented Curriculum

The source for the critique of Weikart's program will be the companion text The Cognitively Oriented Curriculum by Weikart, et. al. (1971)

1. The Nature of Subject - Object Relationship:

Weikart's Cognitively Oriented Curriculum is designed along a three sided framework:

1. Cognitive content consisting of classification, seriation, temporal relations, and spacial relations.
2. Levels of representation consisting of index, symbol, and sign.
3. Levels of operations consisting of motoric and verbal activities.

The Cognitively Oriented Curriculum with its emphasis on the acquisition of cognitive skills, reflects a basic empiricist position that separates process

from content or subject from object. Throughout the entire program, Weikart emphasizes that teachers must have certain goals in mind selected from the four content areas, she must decide which levels of representation should be utilized to sequence activities and finally she must choose between motoric and verbal levels of operation to implement the cognitive goals.

This represents a false interpretation of Piaget's epistemology as it relates to subject-object unity. The Weikart rationale is essentially empiricist in nature and emphasizes that which is external to the child. The basic teaching methodology implied in the Cognitively Oriented Curriculum can only be characterized by the external manipulation of the child's environment.

For Piaget, thinking does not exist apart from content. Cognitive content (classification, seriation, etc.) are not objects or information. They represent logical structures about what to do with objects. Objects should be manipulated, but as a means of transforming reality. Since knowledge is constructed by transformation, children must deal with reality itself.

2. The Construction of Operations:

Throughout the entire Cognitively Oriented Curriculum no direct reference is made to the constructive nature of operations. The only statement Weikart makes regarding operation is that they "are representational acts which have been organized into a functional whole and are related to other such systems." (pp. 4)

Clearly this is not Piaget's notion of an operation. An operation according to Piaget (1970b) "is an action that can be internalized; that is, it can be carried out in thought as well as executed materially." (pp. 21) Piaget uses the term operation to refer to the thinking act itself and it need not be exhibited by external action.

When Weikart does use the term operation, it is associated with motoric and verbal levels of operations. No where in the Piagetian literature can the

notions of motoric and verbal levels of operations be found. Piaget refers to sensory-motor intelligence in which the form of knowledge is tied to the content of specific sensory input or motoric action. However sensory-motor intelligence refers to external acts while an operation is an internal act. Furth (1969) notes that "a sensory-motor scheme is manifest in an external act." (pp. 56) The term verbal level of operation is totally alien to the Piagetian epistemology and therefore unique to the Cognitively Oriented Curriculum.

3. The Nature of Physical and Logico-Mathematical Knowledge:

Similarly to the Lavatelli program, the Cognitively Oriented Curriculum uses the acquisition of a few mathematics content areas, they do not however represent Piaget's epistemological notion of logico-mathematical knowledge. All of the activities suggested in the activity guide (pp. 89-145) are organized around the four content areas. What Weikart fails to realize is that logico-mathematical knowledge is what children use when they think; it is the structure of logical thought. The framework of the Cognitively Oriented Curriculum is an empiricist interpretation of logico-mathematical knowledge; not a constructivist position.

4. The Representation of Knowledge:

Weikart's basic interpretation of Piaget's notion of representation is essentially correct. The Cognitively Oriented Curriculum clearly delineates the three levels of representation, i.e. index, symbol, and sign. However the major flaw in the Cognitively Oriented Curriculum is that the program as implemented places the levels of representation as external to the child. In Piaget's epistemology, it is the child, based on internal structures, that constructs representational symbols (play, images, language).

According to Furth (1969) to state that "the external world is known through symbols" is to "effectively demolist the basic structure of Piaget's

operative theory . . ." (pp.92) Furth continues:

> Once symbols are endowed with the power to represent so as to take the place of things outside, the temptation to treat them as functional objects is almost irresistible . . . With this the ultimate explanation of knowledge is taken way from the constructive and representing activity of the intelligent knower and delegated to these symbols as so-called mediators or objects of knowledge . . . A symbol as a representation needs a living person who constructs the representation . . . (pp. 93)

It is only through constructed operational structure is the relation of knower and representation assured. Symbolic function is indissociable from children's cognition and any product of symbolic functions (play, imitation, language) are supportive but not an element of the operational act itself. Symbolic representations are external manifestations of internal acts.

In addition to the basic misunderstanding of the levels of representation, the Cognitively Oriented Curriculum also equates the representational levels to the operational stages, i.e. index to sensory-motor, symbol to pre-operational, and sign to concrete and formal operations. Piaget makes no reference to such an equated relationship.

Constance Kamii's and Rheta DeVries Piaget for Early Education

The source for the critique of the Kamii and DeVries' program will be the companion text Piaget for Early Education (1975).

1. The Nature of Subject - Object Relationship

It is clear from the basic philosophical orientation stated by Kamii and DeVries that their curriculum is directed toward the development of the young child. Their "conviction is based on the fact that if children are automonous, curious, and alert in Piaget's stage 1, they will inevitable end up in stage 2, and if they continue to be autonomous, curious, and alert in stage 2, they will inevitably end up in stage 3, etc." (pp. 37)

In contrast to the Lavatelli and Weikart programs, Kammi and DeVries indicate only two loosely defined cognitive objectives:

1. To come up with interesting ideas, problems, and questions.
2. To put things into relationships and notice similarities and differences.

The choice of these objectives is directly related to Piaget's epistemology of a subject-object unity. Kammi and DeVries feel that central to Piaget's theory is that intelligence develops as a whole and cannot be compartmentalized into objectives of classification, seriation, spacial logic, etc. The objectives are directly related to Duckworth's (1972) notion of "the having of wonderful ideas."

Instead of structuring specific learning activities to achieve cognitive objectives, Piaget for Early Education emphasizes daily living to stimulate children to develop. For example, snack time is used as a unique curriculum vehicle for the child to "anticipate, make judgement, and compare his anticipation with the outcome." (pp. 46)

The Piaget for Early Education program is organized by the child because they are constantly trying to make sense out of the world. There is a minimal amount of adult imposition. Children use the majority of the day in free choice activities and are free from a regular routine. Kammi and DeVries emphasize the important thing in organizing a curriculum is to maximize "each child's independence, initiative, alertness, curiousity and involvement." (pp. 60)

2. The Construction of Operations:

Kamii and DeVries indicate that their curriculum is not derived from an attempt to teach Piagetian protocols nor to move children through the various developmental stages. Similarly to Piaget, they see knowledge as being constructed an an organized whole. Keeping within Piaget's biological perspective, the construction is from a less differentiated whole to a more differentiated organization.

Given this perspective, they view their curriculum as providing a rich environment "by which individuals can become more intelligent, autonomous, mentally healthy, and moral." (pp. 39)

The curriculum reflects a deep concern for the horizontal development as a precursor to any verticle movement. Central to the curriculum is the Piagetian assumption that operations are constructed out of "wrong" answers. Since their goal is not to accelerate stage progression, "but to the extent to which past construction (even if "wrong") enable the child to construct knowledge in the future at ages ten, fifteen, and beyond." (pp. 74) A statement by Piaget (1970a) reflects the basic rationale for the Kamii-DeVries program as it relates to an attempt to teach operations too early:

> . . . each time one prematurely teaches a child something he could have discovered for himself, that child is kept from inventing it and consequently from understanding it completely. (pp.715)

4. The Nature of Physical and Logico-Mathematical Knowledge:

The Kamii and DeVries curriculum is organized to facilitate physical and logico-mathematical knowledge. "In physical knowledge, the teacher encourages the child to find the answer directly from objects. In logico-mathematical knowledge, the teacher refrains from telling the right answer or reinforcing it, and, instead, encourages reflecting abstraction." (Kamii and DeVries, 1975, pp. 67)

Because Kamii and DeVries see physical and logico-mathematical knowledge as actions rather than something to be acquired from outside the child, the curriculum is consistent with the basic epistemology of Piaget. It is clear from the activities in the curriculum that it is the child that constructs the coordinated relationships. Instead of just manipulating objects, the activities are designed to permit the child to engage in reflective abstraction. The feel "because there is nothing arbitrary in logico-mathematical knowledge, if the

child constructs it at all, he will construct it toward more and more coherence." (pp. 16) Teachers in the Kamii and DeVries curriculum are instructed to refrain from giving direct feedback but to encourage reflective abstraction. The importance of reflective abstraction is indicated by the cognitive objectives of the program - to come up with interesting ideas, problems, and questions, and to put things into relationships and notice similarities and differences.

4. The Representation of Knowledge:

The Kamii and DeVries curriculum has a firm grasp of Piaget's notion of representation.

> For purposes of teaching, it is important to recognize that it is not the index, symbol, or sign itself which represents an object. Representing is what the person does by giving meaning to indexes, symbols, and signs. Words, for example, are only as meaningful as the knowledge of the individual who uses them. Thus, teaching of representation does not consist of presenting a list of words to learn, but rather, it focuses on developing the ability to represent knowledge already constructed on the practical level. (pp. 49)

In contrast to the Weikart program, the various levels of representation are things that children do rather than what is presented to them as representation. The activities in the curriculum are coded for symbol and sign but only as an indication of the child's action; not developmental benchmarks. Although Piaget's notion of symbolic representation is central to his epistemolgoy, in a pedagogical context it should be used as a means of determining how a child is representing knowledge and not as an externally imposed modality of development.

Conclusions

An epistemological critique of the three Piaget-based early childhood programs leaves one with the impression that transforming a constructionalist epistemology for a society founded on empiricist tradition is indeed difficult. Although the analysis has been critical of the Lavatelli and Weikart curricula,

they most likely provide meaningful experiences for the young child. However to label the programs as Piaget-based is somewhat dubious.

The many changes being made in the name of Piagetian philosophy in hope of changing the educational system are totally inadequate. The programs are commendable as far as they have been able to go, but they are working toward the attainment of an almost hopeless goal. These attempts can be, at the same time, dangerous if those who adopt them assume that their use is the major step in changin the educational system and bringing about the constructionalists' view of the education of children. The organization ofthe School is such that any attempt to change one part of the mechanism triggers a self-styled homeostatic reaction resulting in the formation of institutional scar tissue and negating the intended change. What we really need is a change in our view of children and teachers across the board. It will take a revolution of mind to bring such a change; not curriculum innovation or reform.

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