INTEGRAL WORLD

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Why Postformal Stages of Development are not Formal, but Postformal

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The first Beyond Formal Operations Symposium was held at Harvard in 1981. The resulting text *Beyond Formal Operations* (Commons, Richards, & Armon, 1984) was published by Praeger. There have been many subsequent publications on the subject. Occasionally people suggest that the postformal stages posited by theorists and empirical researchers could still just be formal stages or are otherwise too inadequately specified to justify them as different from the formal stage (e.g., Kallio, 1994; Marchand, 2001, 2008; Meyerhoff, 2005.) Formal stage thought and action is characterized by arguments based on empirical evidence, if-then linear logic, and hypotheses based on simple, one-variable causation (Commons, Trudeau, Stein, Richards, & Krause, 1998). Postformal stage thought and action is identified by many (e.g., Bassesches, 1984; Commons & Richards, 1984a, 1984b; Commons, Trudeau, Stein, Richards, & Krause, 1998; Cook-Greuter, 1990; Kegan, 1982; Loevinger, 1970) to occur after Piaget's (Inhelder & Piaget, 1958) formal operations stage. These researchers find empirical measures to support their claims. Despite the decades-old and still growing body of empirical work demonstrating that some humans do perform postformally, here and there the notion persists that postformal behaviors are just some kind of expansions of formal stage behaviors. The motivation for this paper is to lay to rest, in definitive terms, the lingering signs of this decades-old confusion.

This confusion may have two sources. The first source, an historical one, is indicated in the adult development field's early efforts to tease apart what Piaget was attempting to describe as his formal stage. Because he “was not clear enough about that himself” (Kohlberg, 1990, p. 264), some efforts (Demetriou & Efklides, 1985, 1986, as cited in Demetriou, 1990; Kohlberg, 1984) focused on developing finer ways to discriminate the composition of formal thought. Even those efforts revealed operations that corresponded with postformal stages already established by others, yet the operations were still being classified as various aspects of formal operations (Demetriou, 1990; Kohlberg, 1990). At this point, it might have appeared that arguments involved semantics as much as anything. But solid theory does not rest upon semantics. Beginning in the late 1970s, Commons & Richards (1978) had articulated a postformal stage and the requirements for new stage-generation, using the term stage generator. And they developed the General Stage Model (Commons & Richards (1984a, 1984b). At the same time, Fischer (1980) developed his levels. Yet the semantical differences persisted. Commons, Richards and Armon (1984) attempted to construct how the various models were coordinated. They made up a table with a description of the General Stage Model stages and asked people to place their own stages on the same grid.

Thus, the state of affairs in the then-young field of adult development was still characterized by the lack of coordinating the premises of its various stage theory sequences and to the extent to which they existed their systems. This lack of coordination motivated Kohlberg and Armon (1984) and Kohlberg (1990, p. 265) to advocate for a “hard stage model” of development. The General Stage Model, since formalized as a general theory of behavioral development and renamed the Model of Hierarchical Complexity (Commons, Goodheart, Pekker, Dawson, Draney, & Adams, 2007, 2008; Commons, Trudeau, Stein, Richards, & Krause, 1998), accomplished the purpose of specifying “hard stages,” although that term is not used in the Model.

The second source of confusion seems related to the first. It appears to be the case that if people do not recognize how or when such a “hard stage” requirement is met, this historical confusion persists. For example, even though a selection of Marchand's (2005, personal communication) data was scored using the Hierarchical Complexity Scoring System and demonstrated the existence of postformal stages (Commons, Rodriguez, Miller, Ross, LoCicero, Goodheart, & Danaher-Gilpin, 2007), she recently again raised questions about the existence of postformal stages (Marchand, 2008, Marchand, H. & Kallio, E., 2009). What makes postformal stages postformal rather than formal stage extensions or expansions? Accordingly, our purpose here is to spell out, unequivocally, how and why postformal stages are not formal stages in any shape or form, or by any validated measure. A new stage is defined by the three axioms below. In Inhelder and Piaget, logical-mathematical structures were much too narrow and unnecessarily mentalistic. The Model of Hierarchical complexity replaced them with modern algebraic notions of: 1. “defined in terms of” as the higher order action are defined in terms of the lower order actions. 2. Organizes these lower order actions; 3. In a non-arbitrary way.

In the Model of Hierarchical Complexity, the structure is in the tasks. What a mental structure is other than a metaphor not clear. In MHC, Axiom 1 forces that development is organized in stages of different structural complexity, and therefore qualitatively different. This is because the higher order stage actions are defined in terms of the lower order ones. As discussed later on, the higher order actions cannot be equal to the lower order ones and are therefore qualitatively different. The higher order one is also one order higher.

In Piaget (1983), attaining a stage corresponded to a moment of equilibrium which was to be characterized by logical-mathematical structures. Equilibrium has been translated by Commons & Richards (2002), Sara Ross (2008) and Theo Dawson-Tunik, (2006) as the last step in stage transition.

The Stage Generator: What Makes a Stage a Stage

The first issue to address, then, is how any stage of development is specified without ambiguity. Historical ambiguity resulted from not understanding the process of stage generation, that is, how new, distinguishable stages come about at all. Piaget's work articulated some of this process. However, by not articulating the entire stage generation process and all of its requirements, his work also contributed ambiguity beyond his own difficulties in describing formal and earlier stages' operations. The Model of Hierarchical Complexity used and added to Piaget's formulations of stage development to complete the explanation of how developmental stages are generated, and specify the necessary and sufficient axioms. This fills the knowledge gaps and removes the basis of confusion.

As a general theory, the Model of Hierarchical Complexity makes a distinction that other developmental theories do not. It distinguishes between the content- and scale-free order of hierarchical complexity inherent in any task, and the stage of performance of tasks at given orders of hierarchical complexity (for elaboration of this distinction, see Commons, Trudeau, Stein, Richards, & Krause, 1998). We mention this because while we use the terms order and stage below, readers may initially wish to ignore the distinction until the paper's main arguments are presented. That is, when reading “order,” one may wish for the sake of temporary familiarity to relate it to one's current conception of “stage.” This temporary mental substitution may support focus on this section's objective. That objective is to explicate the generation of new stages of performance: the stage generator concept (Commons & Richards, 1978).

The starting point for understanding what makes a stage is expressed in the informal statements of the three main axioms.

- Axiom 1 of the Model of Hierarchical Complexity (Commons, Goodheart, et al., 2008) posits that consistent with Piaget, that higher order actions are defined in terms of two or more lower-order actions. In terms of set theory, A = {a, b} where A is the higher order set, and a and b are lower order actions that are elements of that set A.. Note that the element a cannot equal the set A. An element cannot equal a set formed out of that element.
- Axiom 2 of the Model specifies that the higher order action coordinates lower-order actions.
- Axiom 3 states that the ordering of actions is not arbitrary.

Together, these axioms specify a universal stage generator that is both necessary and sufficient to eliminate confusion or debates about what makes a stage a stage.

The validity of hierarchical complexity for measuring what makes a stage a stage has been established. Rasch analyses (1980) have been used to validate orders of hierarchical complexity (e.g., Adams, 2006; Commons, 2006; Commons, Goodheart, et al., 2007; Miller, 2008; Richardson & Commons, 2008; Robinett, 2006). Through seven studies to date, Dawson-Tunik's (2006) work has validated the consistency with which hierarchical complexity accounts for stages of development across multiple other instruments that were designed to score development in specific domains. Along with other studies she performed, these support the claim that “the hierarchical complexity scoring system assesses a unidimensional developmental trait” and thus “satisfies the first requirement for good measurement, the identification of a unidimensional, context-independent trait” (pp. 445).

In sum, one task is more hierarchically complex than another task if:

1. It is defined in terms of two or more lower order task actions. This is the same as a set being formed out of elements. This creates the hierarchy

   A = {a, b} a, b are “lower” than A and compose set A

   A ≠ {A,...} A set cannot contain itself

2. It organizes lower order task actions. In simplest terms, this is a relation on actions. The relations are order relations

A = (a, b) = {a, {b}} an ordered pair

3. This organization is non-arbitrary. This means that there is a match between the model-designated orders and the real world orders.

   Not P(a,b) not all permutations are allowed

We recognize the possibility, however, that as abstractions, perhaps neither axioms, nor set theory, nor references to validation studies provide sufficiently concrete explication for the reader. Thus, we offer explanatory discussion to flesh out the implications of stage generation, applied specifically to the stage of formal operations.

Formal Operations

If it were the case that whatever has been referred to as postformal stages over the last three decades actually amounts to formal stage behaviors, it would imply that the tasks at all the postformal orders of hierarchical complexity could be accomplished by people performing at the formal stage. Performance at the formal stage means that tasks, or actions, are at the formal order of hierarchical complexity. We address why postformal actions cannot be done at the formal order and why they are not a horizontal extension of the formal order in any sense. To support the following discussion, we first introduce the orders and stages of hierarchical complexity used in it. Table 1 provides descriptions of the orders from abstract to systematic.

Table 1. Orders of Hierarchical Complexity and Structures of Tasks

Order/Stage Ordinal and Name	General descriptions of tasks performed
9 Abstract	Discriminate variables such as stereotypes; use logical quantification; form variables out of finite classes based on an abstract feature. Make and quantify propositions; use variable time, place, act, actor, state, type; uses quantifiers (all, none, some); make categorical assertions (e.g., We all die.). Task: All the forms of five in the five rows in the example are equivalent in value, x = 5.

10 Formal	Argue using empirical or logical evidence; logic is linear, one-dimensional; use Boolean logic s connectives (not, and, or, if, if and only if); solve problems with one unknown using algebra, logic, and empiricism; form relationships out of variables; use terms such as if...then, thus, therefore, because; favor correct scientific solutions. Task: The general left hand distributive relation is x * (y + z) = (x * y) + (x * z)
11 Systematic	Construct multivariate systems and matrices, coordinate more than one variable as input; situate events and ideas in a larger context, i.e., considers relationships in contexts; form or conceive systems out of relations: legal, societal, corporate, economic, national. Task: The right hand distribution law is not true for numbers but is true for proportions and sets. x + (y * z) = (x * y) + (x * z); x ∪ (y ∩ z) = (x ∩ y) ∪ (x ∩ z) Symbols: ∪ = union (total elements); ∩ = intersection (elements in common)

To indicate why postformal actions cannot be done at the formal order, that is, that they are not a horizontal extension of formal order action, it is only necessary to show that no next, systematic order task can be reduced to a chain of formal order actions. To show this we state that the systematic order actions are sets of actions from the formal order. Central to confusion to date may be set relationships. ***Sets cannot be equal to their members.*** Thus, A does not equal a, or b when A = {a, b}.

To show this, consider the empty set φ. Note that φ = { } has no members. Nothing means there are no members. How can φ = nothing when φ is a set and nothing is nothing? Something cannot equal nothing.

Two examples of this concept from set theory are given below. The first uses narrative from an established instrument called the Helper-Person Problem, and the second uses algebra.

The Helper-Person Problem begins with a vignette that relates the generic situation of a client or patient seeking assistance from a professional named Allen. After Allen speaks with the Person to assess the problem, the following sequence of actions is given:

1. Allen offers to provide guidance and assistance.
2. This form of guidance and assistance is seen as the most effective in treating this problem.
3. Allen also presents other forms of guidance and assistance as well
4. Allen discusses the benefits and risks of each as well, including doing nothing.
5. Allen tries to understand the Person's needs and concerns.
6. Allen asks and answers many questions.
7. Allen also observes the Person's body language.
8. Allen wants to know whether their body language matches their statements
9. Allen asks if the Person is ready to make a choice.
10. Allen tells the Person to base their decision on their previous discussion
11. The Person feels Allen knows best
12. The Person accepts the guidance and assistance.

Formal statement 1 consists of

5. Allen tries to understand the Person's needs and concerns.
   This leads to
6. Allen then asks and answers many questions.
   Together these form a formal order statement

Allen trying to understand the Person's needs and concerns “causes” Allen to ask and answer many questions.

Formal statement 2 consists of

7. Allen also observes the Person's body language.
   This leads to
8. Allen wants to know whether their body language matches their statements
   Together these form a formal order statement:

Allen observing the Person's body language “causes” Allen to want to know if their body language matches their statements.

Together, these formal order statements form a system at the systematic order. In the first part of the system, Formal statement 1 is defined in terms of abstract statements 5 and 6. It organizes them into a causal sequence. Formal statement 2 is defined in terms of abstract statements 7 and 8. It organizes them in a causal sequence. Thus, there are two causal statements. Causal statements are defined as formal statements, that is, they rest on linear logic that uses one causal input. Each formal statement is a set formed out of two abstract statements. Each formal statement is independent of the other.

The systematic order coordination task is to form a set containing the two formal statements as elements. The systematic order coordination is reflected by statements 9 and 10: Allen asks if the Person is ready to make a choice. Allen tells the Person to base their decision on their previous discussion. This results in a system that coordinates the previous formal relations without the formal relations being repeated in the system. It forms a set containing the elements by forming a system that could not be formed without them as its elements.

To underscore the relation of set theory to the foregoing discussion, the system corresponds to a set. The formal relations that are not repeated in the system correspond to the elements of lower rank elements that comprise the set. That is, a set is not at the same rank as its elements, the elements are at a lower rank than the set, and therefore the set is not equal to its elements.

An example from Algebra may demonstrate the same distinction. Take the simple formal order equation,

$x = \frac{1}{2} y - 1$

There is a very simple solution at the formal order to solve for y.

But consider the pairs of equations

Equation 1: $x = \frac{1}{2} y - 2z$

Equation 2: $2x = y + 2z$

There are no formal order actions that tell one how to work with two equations. Each of the equations belong to the set of actions at the systematic order, for reasons explained next.

At the formal order, solving a linear equation is straight forward. One puts the variable one wants to solve for on the left side, divides out its coefficient, and moves any other variables to the right hand side, remembering to multiply them by minus one. (This is the same as subtracting the term from both sides.)

Demands of solving two equations with two unknowns requires some way of combining equations. The only way to do this is to have some way of eliminating one of the variables. The only way to eliminate one variable is to make the same variable in the two equations have the same coefficient and then to combine the equations.

The systematic order task will be the coordination performed by adding the equations. There are other coordinations possible for solving these two equations. In each case, the goal is to eliminate one of the variables. Adding the equations is what is necessary but not available with just formal actions. One has to see that y is co-determined by both x and z, two input variables. This task does not exist at formal order, which can operate on only one input variable, i.e., solving for one unknown.

Therefore, the following is as far as one can go in solving each of the equations at the formal order:

Equation 1:
$\frac{1}{2} y - 2z = x$
$\frac{1}{2} y = 2z + x$,
$y = 4z + 2x$
$y = 2x + 4z$

Equation 2:
$2x = y + 2z$
$y = 2x - 2z$
$-y = -2x + 2z$

The formal order task enables one to get the y unknown on the left side of each equation. Think about it. What is the formal action that tells you what to do? But, beyond the step of getting the y unknown on the left, step, there is no formal order action to inform one about the next step. Adding equations is not a task available in formal order actions. Adding equations is more complex in this algebra example because of the higher order task that algebraic solving for multiple unknowns involves. However, merely adding things in other cases is merely adding, which is horizontal, not vertical, complexity.

Hence there is no formal action that tells one how to combine two formal relations. Formal order actions include relations between variables. They do not include actions about how to combine two or more relationships among formal relations. Note that y is a function of x and z and is not a relation between variables. It is a relation among relations of variables. Such function relationships are systematic order tasks to conceive and operate upon. A set of relations is different and not equal to a member relation. Hence the action of adding equations is not a relation between variables but a relation among relations, so that a systematic order relation is the result of the sum of equations.

Theoretical Summary

Concepts from set theory were applied here to clarify why formal stage tasks can be coordinated only at the next stage, systematic. Consistent with Piaget and the Model of Hierarchical Complexity, the concepts apply to all stages that precede the formal stage, as well (and in the case of the Model), those that follow the formal stage). A central premise in these theories is that each next stage of performance coordinates the actions performed at the preceding order of complexity. To apply the premise successfully, the actions of each stage must be unambiguously specified. The stage generator concept successfully eliminates ambiguity about makes a stage a stage by precise specification.

The Model of Hierarchical Complexity specifies how these relationships of sets and their elements relate in the development of increasingly complex actions. The theory's axioms may be used to test if an action is performed at a higher order of hierarchical complexity or not, i.e., if it is at the same or a higher stage. We supply simple sample material below to indicate how to do this, which supplements the higher stage Helper-Person items used earlier. There are three axioms, which can be used as follows to test this on content where there are two or more adjacent tasks or behaviors in a sequence. Although the first axiom was introduced above, it is repeated below in the set of all three axioms along with questions that can be used to apply them.

The informal statement of axioms below are next applied to the following examples. These examples supply content comprised of two or more adjacent tasks or behaviors in a sequence. The question to be addressed are the sequence of actions just a chain of behaviors or do they form a hierarchically ordered sequence?

- Axiom 1. Higher order actions are defined in terms of two or more lower order ones.
  Question to apply to each example: Is the last action in the sequence defined in terms of those that precede it? This is usually enough to reject that the sequence of actions under examination is a hierarchical sequence rather than just a chain of actions sequence.
- Axiom 2. The higher order actions organize or transform the lower order ones.
  Question to apply to each example: Does the last item in the sequence organize or transform,
  Organization may been putting the action is some temporal or spacial sequence of execution.
- Axiom 3. The organization is not arbitrary.
  Questions to apply to each example: Is the organization from the application of axiom 2 non-arbitrary? Could it be other than it is? Is it necessarily so, for the action under consideration to match some real world, logical, or mathematical constraint?

Marchand (Personal communication, January 2010), also suggests that the MHC conception of stage may be more functionalist than structuralist (i.e., stage as performance of tasks of a given order. But there is probably both functionalism and structuralism in the MHC. The functionalism is that stages are based on performance on tasks. The structuralist part is that sequences that are generated using the MHC are ordinal structures. Each order is qualitatively different and irreducible to any of the lower orders.

Piaget also has studied the functional aspects seeing development not only as succession of stages of equilibrium but also as moments of preparation and construction and of conclusiveness. He identified these two moments in formal stage (FA and FB). Theoretically, for Marchand, the systematic stage could be FB. But Kohlberg (1990) argued that it was FC. FA is abstract, FB is formal. Also Rasch Analyses (Commons, Goodheart, Pekker, Dawson, Draney, & Adams, 2008) validated the sequence from concrete, through abstract, then formal, systematic and then metasystematic.

We are hopeful that this presentation is instructive and helps to lay to rest the confusions about the existence of stages that follow the formal stage and are not extensions of it or reducible to it.

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