**Background**

Developmental psychology postulates one regulative principle of development; it is an orthogenetic principle which states that wherever development occurs it proceeds from a state of relative globality and lack of differentiation to a state of increasing differentiation, articulation, and hierarchical integration (1957).

**development**  **complexity**  **skill theory**

From a Piagetian perspective, cognitive development is the activity of reflective abstraction, through which new knowledge is constructed from existing knowledge. Hierarchical integration is the product of reflective abstraction, and hierarchical complexity is the most direct observable manifestation of hierarchical integration.
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The origins of the hierarchical complexity construct, as it is defined here, are in the work of Jean Piaget,
whose model of mental representation delineates five developmental stages (and a varying number of
sub-stages). These have been represented as the (1) reflexive, (2) sensorimotor, (3) symbolic or
preoperational, (4) concrete, and (5) formal stages (Piaget & Inhelder, 1969). Each of these
developmental stages is defined by a set of formal properties. In the Piagetian model, development from
one form of thought to the subsequent form involves a process of hierarchical integration, in the sense
that the actions of the earlier form become the content of the actions of the latter (Piaget, 1985). A
number of researchers have described general developmental sequences that elaborate this notion of
hierarchical integration (Baldwin, 1894; Case, 1991; Demetriou & Valanides, 1998; Fischer, 1980;
Pascual-Leone & Goodman, 1979; Werner, 1948). Recently, for example, Noelting and Rousseau (2000)
employed the notion of hierarchical integration to demonstrate that each Piagetian stage is composed of
three levels — two substages and one consolidated stage — to form a hierarchy of 12 levels covering
the period from early childhood to adulthood. The concept of hierarchical integration is also fundamental
to several neo-Piagetian models of cognitive development, including those of Fischer (1980), who
emphasizes the development of skill hierarchies in particular contexts; Pascual-Leone and Goodman
(1979), who focus on the growth of mental attention and memory capacity; Case (1991), who describes
the development of memory capacity and associated processing structures; and Demetriou & Valanides
(1998), who describe hierarchical development in terms of processing functions.

(Complete references for the articles cited in this panel can be found under the references tab.)
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Fischer's (1980) skill theory provides the primary theoretical foundation for the LAS. Fischer and his colleagues (1998) have contributed a large body of empirical work describing the complexities of skill development in a variety of contexts and knowledge domains. Commons' (1998) Model of Hierarchical Complexity, a model of the hierarchical complexity of tasks, has also provided many of the concepts we employ in our model. We have also borrowed heavily from the insights of a number of researchers who have described development in particular domains. Fischer's (1980) skill theory describes 13 skill levels. With permission, we use Fischer's skill level names for our Lectical™ levels, which we also refer to as complexity levels.

(Complete references for the articles cited in this panel can be found under the references tab.)
Colleagues' work

(our work)


