ELSEVIER

New Ideas in Psychology 23 (2005) 185–196

NEW IDEAS IN PSYCHOLOGY

www.elsevier.com/locate/newideapsych

Change processes in development: The concept of coactive scaffolding

Michael F. Mascolo*

Department of Psychology, Merrimack College, North Andover, MA 01845, USA

Available online 1 August 2006

Abstract

The concept of *scaffolding* is generally invoked to refer to the ways in which a more expert individual assists a child by performing a part a task or by otherwise directing or supporting a child's task-related actions. A coactive systems model of development provides a framework for examining other ways in which person-environment relations may scaffold development. From a coactive systems view, the unit of analysis for understanding development is the coactive person-environment system. Within such a system, although individual actors exert control over their actions, thoughts and feelings, action is the product of coactions among each element of the system over time. From this view, coactive scaffolding refers to any process outside of an individual's direct control that functions to direct individual action toward novel or higher-order forms. Three broad categories (and subtypes) of coactive scaffolding are proposed and illustrated: *ecological* scaffolding, *social* scaffolding, and *self*-scaffolding.
© 2006 Elsevier Ltd. All rights reserved.

1. Introduction

In the past decades, the concept of *scaffolding* has generally been used to refer to the processes by which a more expert individual assists a child by performing a part of the task for the child or otherwise directing or supporting the child's actions throughout the course of task activity. The notion of scaffolding was proposed by Wood, Bruner, and Ross (1976) and is organized with reference to Vygotsky's (1978) socio-cultural approach to psychological development. In the context of direction and assistance, a child becomes able to perform at a level that is higher than he or she could ordinarily sustain while acting

*Tel.: +978 837 5000/4373; fax: +978 837 5069.
E-mail address: Michael_Mascolo@Yahoo.com.

0732-118X/$ - see front matter © 2006 Elsevier Ltd. All rights reserved.
doi:10.1016/j.newideapsych.2006.05.002

alone (Gauvain, 2002; Wood et al., 1976). For example, in their now classic study, Wood and Middleton (1975) asked mothers to teach their 4 and 5-year-old children to arrange blocks into the shape of pyramid. Although the children were unable to complete the task working alone, they were able to construct block pyramids under the direction of their mothers. In scaffolding, as children develop mastery over target skills, adults gradually turn mastered components over to children. In so doing, their scaffolding raises children's actions to new heights. Scaffolding supports the production of higher-order actions so that children can perform the necessary acts of internalization, appropriation or re-construction that ultimately bring about developmental change.

Although the scaffolding metaphor has proven useful in developmental analysis, it raises several issues. First, while the concept of scaffolding depicts development as a social process, the metaphor nonetheless directs attention primarily to the structuring actions of the expert. As such, the scaffolding metaphor fails to take into consideration the ways in which individual learners contribute to the scaffolding process. A second issue concerns the processes by which scaffolding leads to development. It is customary to invoke concepts such as *internalization* to explain the processes by which scaffolding structures development (Vygotsky, 1978). However, many scholars (Mascolo & Fischer, 2005; Rogoff, 1990; Wertsch, 1998) have noted that the internalization metaphor does not adequately explain what children must do in order to profit from their scaffolded interactions with others. Without such an explanation, the concept of scaffolding is incomplete as a social mechanism of change (Butler, 1998). Third, to the extent that experts direct a novice's constructive activity, the traditional concept of scaffolding suggests a relatively fixed and pre-defined endpoint in the development of scaffolded activity (Butler, 1998). However, a focus on externally directed learning can obscure analyses of the dynamic, emergent and open-ended nature of development. Therefore, one might suggest a more *coactive* conception of scaffolding in development.

2. The concept of coactive scaffolding

From a coactive systems approach (Mascolo & Margolis, 2005), the person–environment system functions as the primary unit of developmental analysis. Fig. 1 provides a schematic model of the person–environment system. The person–environment system is

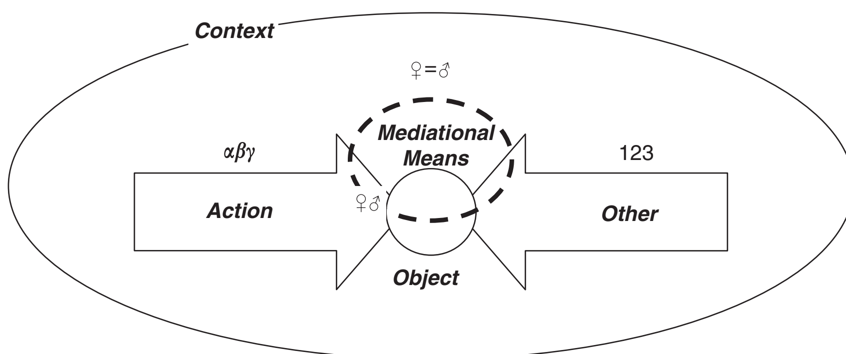

Fig. 1. Coactive person–environment system.

composed of at least five classes of coacting elements: within a given *socio-cultural context*, *individual actions* are directed toward some physical or psychological *object*. In interaction with *other persons*, individuals engage dialogically using a variety of different *mediational means*, including signs, symbols and other cultural tools. From a coactive systems view, although these components are distinct from one another, they are inseparable as causes of individual action and development. Individual action emerges as the product of coaction among components and is not the linear outcome of components acting independently. It follows that within particular contexts, *control over the construction of action and meaning is distributed throughout the coacting elements of the person– environment system* (Granott, 1998; Salomon, 1993; Wertsch, 2002).

There are important consequences of adopting the person–environment system as the unit of developmental analysis. Although many approaches have embraced an interactive approach to development, empirical analyses often tend to focus on the independent contributions of one or more elements of the person–environment system. However, moment-by-moment analyses of changes in the person–environment system can illuminate how subtle and non-obvious coactions among system elements can create novel ways of thinking, acting and feeling in real time. Understood from this view, the concept of scaffolding takes on a new dimension. To the extent that novel behavior arises as the product of coactions that include but extend beyond the dyad, it is possible to identify many ways in which environmental input can organize, direct or otherwise scaffold novel forms of acting, thinking and feeling.

From a coactive systems view, *coactive scaffolding occurs when elements of the person– environment system beyond the direct control of an individual actor direct or channelize the construction of action in novel and unanticipated ways*. Whereas the traditional notion of scaffolding is defined loosely in terms of the structuring actions of more expert others, the foregoing conception is defined with reference to the concept of *skill* (Fischer, 1980) or individual control. A skill refers to the capacity to control elements of acting, thinking and feeling within particular contexts. Advances in skill analysis make it is possible to identify the precise structure of individual action (Mascolo & Fischer, 2005). In any given context, by identifying the structures of action over which individuals exert

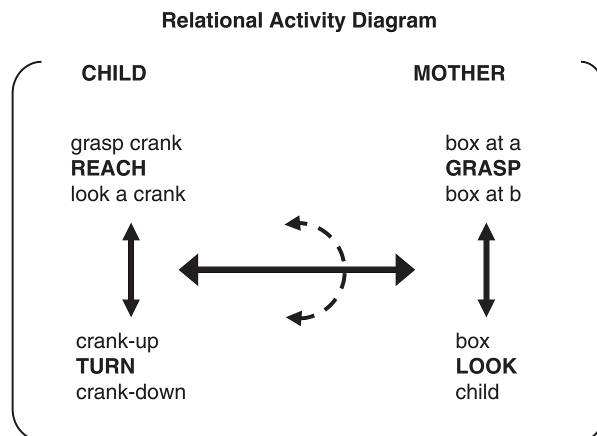

Fig. 2. Relational activity structure.

Table 1
Levels of co-regulated interaction and support

Type of between-individual relation	Example
Assymetrical (Contextual) support	
CS1. Encourage/Prompt: Child executes skill by herself. Social agent provides encouragement, prompts, reminders, or praise without instruction.	Knowing child can throw ball into a basket unassisted, adults says "You can do it!" or simply "Throw it in!"
CS2. Sequential Modeling & Imitation: Novice imitates modeled action *after* the modeling is completed and *without* further support.	After an adult models a complex story, child is able to tell same or a similar story.
Asymmetrical co-regulation (Scaffolding)	
CS3. Asymmetrical Assistance: Expert breaks down task, performs part of task without distancing or direction.	A 15-month-old can turn the crank of a jack-in-the-box if mother holds the box for her.
CS4. Distancing: Expert creates cognitive demand on novice, motivating constructive action (e.g., requests for evaluations, inferences, comparisons, open-ended questions, etc.).	In response to child's question, "where does night come from?", adult asks "What is different about the day and the night?"
CS5. Direction: Expert provides explicit directions about how to perform or understand action or meaning.	Adult tells child how to tie his shoes (e.g., "Put your left lace through the X").
CS6. Concurrent Modeling & Imitation: Novice imitates modeled action while expert provides modeling and direction.	Child imitates adult who models how to cross laces or put one lace under another.
CS7. Guided Modeling & Imitation: Expert models task while physically directing child's actions.	Child yields to adult's hand-over-hand guidance of child's attempt to move one shoe lace under another.

Note. Although not provided here, each form of social scaffolding is identified with a different symbol for use in relational activity diagrams.

control, it becomes possible to identify with more precision how coactions with the environment structure novel action. Toward this end, a relational activity analysis provides a method for identifying the precise structure of joint action over time. Fig. 2 depicts a *relational action structure*, which provides a qualitative and quantitative representation of the structure of as it is organized between a 15-month-old boy and his mother while manipulating a jack-in-the-box. Prior to the event represented in Fig. 2, when given the jack-in-the-box to play with by himself, the child was unable to simultaneously hold the box and turn the crank. However, as depicted in Fig. 2, if his mother held the box for him, the child was able to perform rudimentary turning actions. The left portion of the Fig. 2 specifies the elements of action over which the child exerts control (i.e., looking at and turning the crank up and down); the right portion indicates those elements over which the adult exerts control (i.e., adjusting her grasp on the box to her child's seen and felt actions). The middle symbol indicates the particular form of co-regulated social scaffolding that occurs between the child and adult. In this situation, the mother scaffolds the child at the level of asymmetrical support (Scaffolding Level 3 in Table 1 below). In so doing, she breaks down the task and performs part of it for the child so the child can complete the task. By identifying and charting changes in relational activity structures over time, one

can identify with precision different ways in which social partners and environmental events coactively scaffold novel behavior. Many of the examples of scaffolding reported below were identified using relational activity analyses.

3. Varieties of coactive scaffolding

In what follows, I propose three broad categories of coactive scaffolding. These include *social scaffolding*, *ecological scaffolding*, and *self-scaffolding*. Fine-grained analysis of moment-by-moment interaction is needed in order to identify such coactive exchanges and the ways in which they produce novel forms of action.

3.1. Social scaffolding

Social scaffolding refers to the processes by which co-regulated exchanges with other persons direct development in novel directions. The traditional notion of scaffolding is tantamount to the current concept of *social scaffolding*, but with important differences. Table 1 depicts seven forms of coactive interaction and support that occur in social exchanges. The levels specified are not hierarchical in nature; they differ only in the *degree of support* provided by one social partner to another. Additional forms of social scaffolding may be isolated and added to this list.

The lowest levels of social scaffolding (CS1 and 2) involve the least amount of on-line support on the part of a more expert individual during the process of a child's execution of skilled activity. Using *prompts* and *encouragement* (Level CS1), the novice is responsible for deploying a given skill by him or herself. Social agents simply prompt, remind or request that the child or novice perform a given task. Social agents may also offer emotional encouragement or praise, as long as they refrain from offering assistance or specific direction regarding the task. Consequently, the child is responsible for executing the entire skill without additional assistance. Using *sequential modeling and imitation* (CS2) (Kitchener, Lynch, Fischer & Wood, 1993), a more expert individual *first* models a task in its *entirety* for the child. The novice imitates the modeled action *after* the modeling is completed and without further assistance or direction from the expert. Fischer and his colleagues have this form of support as an assessment tool to demonstrate how the level of children's skill (e.g., story-telling) changes with variations in contextual support. For example, under conditions of sequential modeling and imitation (CS2), the level of a child's story functions several steps higher than when she tells stories in free play (no support) or when she is asked to tell her best story (a condition involving minimal support). Minutes later, however, after an adult reminds the child about key components of the previously modeled story, the child's performance again rises. Such fluctuations occur in the same child under various conditions separated by mere minutes.

Outside of formal assessment contexts, sequential modeling and imitation is relatively rare. In everyday teaching and learning contexts, individuals work with others throughout the course of a given activity. *Asymmetrical adjustment* (CS3) consists of the first level of scaffolding in which *joint* activity occurs during the online process of task performance. In earlier levels (CS1 and CS2), after being provided with contextual support, the child is responsible for executing an entire skill himself. Beginning at the level of asymmetrical assistance (CS3), the adult begins to control parts of the task for the child. For example, in order to reduce the cognitive load on the child, a more expert partner may break down the

task or perform a part of the task so that the novice may complete the remaining parts of the task.

Scaffolding Level 4 involves the use of *distancing* (Cocking & Renninger, 1993; Sigel, 2002). Using distancing, a more expert person uses semiotic means to create a demand on a novice's representational capacities, motivating constructive action on the part of the novice. Such strategies create distance between the child's current representation of the task and possible future understandings. Using distancing, an interlocutor does not provide explicit direction or instruction; instead, distancing motivates constructive action. Distancing includes requests for evaluations (i.e., ''which is the quicker route?''), inferences (i.e., ''what does that tell you about…?''), comparisons (i.e., ''how does the wildebeest differ from the gazelle?''), open-ended questions (i.e., ''how do you think you can solve it?''), etc.

At Level 5, *direction*, a more expert individual provides explicit and specific instructions about how to perform an action, operation or procedure, or explains to-be-acquired meanings (Cazden, 2002). Levels 6 and 7 consist of different forms of concurrent modeling and imitation. Unlike sequential modeling and imitation (CS2) where a teacher models an entire task or subtask before a child attempts to imitate the action, in *concurrent modeling and imitation* (CS6), the expert models the task, often accompanied by explicit direction as the novice performs the task or tries to imitate the expert's modeling. The novice imitates the expert during the course of the expert's modeling. The level of directive support is increased further in *guided modeling and imitation* (CS7). At this level, with explicit direction, an expert models a task while physically directing the novice's actions with hand-over-hand movements or something similar. In such cases, the novice follows the expert's lead.

3.2. Ecolological scaffolding

Ecological scaffolding refers to the ways in which one's relation to or position within the broader physical and social ecology moves action toward novel forms. Any action necessarily occurs within a physical and socio-cultural context that provides feedback to individual action or otherwise constrains and directs action. Bateson (1972) and others (Wertsch, 1998) have suggested ways in which the mind—considered as the source of intelligent, individual, human activity—''extends beyond the skin''. Bateson (1972) famously maintained that a person using an axe to chop down a tree forms a person–environment system. Within this system, the structure and weight of the axe; the size and density of the tree; the musculature and movement of the arm each function as part of a feedback system. Each element exerts a constraint on the chopping process and thus functions as an integral part of the process of individual action. Contextual feedback changes continuously throughout chopping, introducing new constraints and channels for action. Table 2 identifies forms of person-within-ecology coactions that direct action toward novel forms.

3.2.1. Naturalistic scaffolding

Naturalistic scaffolding involves the use of naturally occurring environmental features in their unaltered state to aid in acting (Cowart, in press). A simple example of naturalistic scaffolding involves standing on a tree stump to pick apples from a nearby tree. The existence and proximity of the tree stump to one's perceptual-motor field suggests possible

Table 2
Forms of ecological- and self-scaffolding

Form of coactive scaffolding	Example
Ecological Scaffolding	Focuses on the position of individual within the person-environment system.
1. Naturalistic Scaffolding: Unaltered naturally occurring environmental features aids or constrains action.	(i) Standing on a stump to pick apples from a tree; (ii) texture gradient in perceptual field constrains depth perception.
2. Positional Scaffolding: Individual's physical or social position in relation to task or context raises the level of action.	Infants in supine position in cushioned cribs are constrained from moving and walking relative to infants placed on stomachs.
3. Task/Object Scaffolding: The structure of the task itself or object of action structures the construction of the new strategy by the actor.	Immediately after child correctly answers $(5+5)$, his upraised fingers support production of correct answer to $(5+4)$ without using counting strategy used minutes earlier.
Self-Scaffolding	Individual uses existing higher-order skill(s) to guide own construction of lower-order skill(s).
1. Cognitive Scaffolding: Individual action produces unintended outcomes that structure novel forms of acting or knowing.	In *Scrabble*, individual physically moves letters around making unintended combinations suggesting new words.
2. Bridging: Individual uses incomplete or higher-order knowledge to construct a partial structure that functions as a target for skill construction.	Interpreting an observation as a "*reaction*" directs a search for "cause" and "effect" components of the "reaction".
3. Analogical Mappings: Form of bridging in which individual uses an analogy to guide novel skill construction.	When adding $(5+1)$, child refers back to earlier problem $(4+1)$, saying "It's one more than the other one."

solutions to the problem at hand. This notion is similar to the Gibsonian (1977) concept of *affordance* (Jones, 2003). According to Gibson (1977), affordances refer to consistent patterns or features provided by the environment that enable, allow, invite, or otherwise constrain perception and action. Examples of affordances include texture gradients in terrain that provide stable and invariant cues to depth perception (Adolph & Eppler, 1998); invariant patterns of moving objects that constrain the perception of object constancy and good form (Kellman & Spelke, 1983); the structural properties of culturally constructed objects that constrain and invite certain forms of action (e.g., a computer mouse conforms to the shape of the hand). Affordances are not simply features of the environment; they are environmental patterns that function with reference to the action potentials of organisms.

3.2.2. *Positional scaffolding*

Positional scaffolding refers to the ways in which an individual's physical position or orientation in relation to a task, object or social context functions to organize, direct, or make an action easier to perform. Posture and physical proximity to elements of a task operate as central yet unacknowledged facets of task performance. For example, Dennis (1960) showed that the motor development of infants who were placed for long periods of time on their backs (without being able to roll over on their bellies) was significantly

delayed in comparison to infants who had the opportunity to lie on their stomachs. The opportunity to lie in a prone position stimulates the infant to raise the head, move the arms and legs, and eventually to scoot, crawl, and walk. Such actions were impeded when infants lied on their backs on a highly cushioned surface. Infants were not able to roll over and thus begin to process of coordinating and strengthening the motor activities that would eventually support crawling and walking. In this example, it is the relation between the structures of the infant's body and the local ecology provides the scaffolding that stimulates motor activity and development.

3.2.3. *Task/object-scaffolding*

Task/object-scaffolding refers to the ways in which the task itself or the objects of action structure the construction of novel ways of acting and thinking. Skills consist of goal-directed actions on objects. Although actions operate upon objects, objects themselves exert an organizing effect on action. In this way, action and object make each other up (Fischer, 1980; Mascolo, 2004). One example of task-scaffolding concerns the use of operant techniques to structure means–ends behavior in infancy (Watson & Ramey, 1972). Using a pressure-sensitive pillow, Watson and Ramey (1972) created a contingency in which a mobile hanging over a child's crib would be made to shake in response to subtle head movements made by the child. Six-week-olds easily learned to move their heads to move the mobile. In this context, the highly constrained relation between simplified head movements and the movement of a prominently displayed mobile structured the capacity to notice and act upon the contingency. Thus, the highly structured task itself directed the construction of novel action.

Another example of task-scaffolding comes from our research on the development of children's addition strategies. In a study adapted from Siegler and Jenkins (1989) groundbreaking microdevelopmental analysis, a particularly precocious 4-year-old boy performed a series of simple addition problems involving digits between one and five. Whereas Siegler and Jenkins (1989) did not present children with problems in which both digits were the same (e.g., 4+4), in our study, this rule was relaxed. In one exchange, when asked to add "5+4", the child invoked a variant of the "counting all" strategy. He first held up five fingers on his left hand, four fingers on the right, then counted all of his fingers from start to finish. On the 20th trial of the session, when asked to add "5 + 5", the child immediately raised five fingers on each hand, looked at his hands, and without counting, provided the correct response. Immediately thereafter (on Trial 21), the child was asked again to add "5+4". At this point, the child held up five fingers on his left hand and four on the other. Without counting, the child immediately provided the correct response (9).

Although the child could not provide an explanation about how he calculated the answer, the child exhibited no evidence of simply recalling the response from the earlier trial (e.g., turning his eyes upward in an act of remembering; making reference to previous trial). Indeed after a few minutes had elapsed, when given the problem 5+4 again, the child reverted to the earlier "counting all" strategy. It is unlikely that the child was guessing, as the child responded with certainty when asked several times within the same trial. Instead, focusing his attention on his fingers, it is likely that the child performed an act akin to *implicit subtraction*. After having just correctly added "5 + 5" by *seeing and recognizing 10 upraised fingers*, and *with a representation of this outcome still present in working memory*, the child could "see" that the fingers raised to add "5+4" were one less than the over-learned "5 + 5". This child's actions illustrate the process of *task-scaffolding*.

The emergent structure of this particular task (presenting "5 + 4" immediately after "5 + 5") provided a unique developmental moment in which the idea that "5 fingers plus 5 fingers makes 10 fingers" was immediately juxtaposed in working memory with the child's sight of his 9 raised fingers. In this example, *the local structure of the task itself* organized the content of the child's consciousness, and thus the online emergence of a strategy that the child could not have otherwise controlled on his own.

3.3. Self-scaffolding

Self-scaffolding refers to the ways in which products of the individual's own actions create conditions that direct and support the production of novel forms of action and meaning. In self-scaffolding, individuals change their environments or representation of the environment in such a way as to direct further problem solving and the construction of novel meanings. There are at least three forms of self-scaffolding.

3.3.1. Cognitive self-scaffolding

Cognitive self-scaffolding occurs when an individual performs actions that directly or indirectly change the environment in ways that suggest new meanings or cognitive operations. For example, when playing the board game *Scrabble*, individuals put together individual tiles by combining different letters into words. In so doing, a player may physically move the letters tiles around to form different semi-random configurations. In so doing, the novel letter patterns may produce different words, or different word suggesting possible words. In this example, deliberate or inadvertent actions on the part of the player (i.e., re-configuring letter tiles) produce environmental changes that prompt novel meanings and cognitive operations (Clark, 1997; Kirsh & Maglio, 1994).

Another example of cognitive self-scafffolding is culled from our research on the development of everyday skills (shoe tying). In one interaction, the teacher modeled the actions of crossing shoe laces to make a tie for a 5-year-old boy. Holding one lace in each hand, the teacher crosses the laces while explaining her actions. Looking at her laces, the teacher noticed that she made an "X" with the laces. At this point, the teacher paused and said, "Look, Ricky, it made an 'X'. Do you see the X?" In this context, the adult's goal was merely to cross the laces as part of her attempt to model the desired action. She did not anticipate that crossing the laces would make an "X". Thereafter, the teacher used the notion of *making an X* as a means for teaching the child how to cross his laces. For example, at one point, the adult said: "make your X"; now "put the lace in your left hand *through* the X". In this context, the teacher's own controlled actions changed the environment in unanticipated ways and thus suggested a new goal-directed meaning—using the notion of an "X" as a novel means for mediating her teaching actions. Because the environmental change was an indirect outcome of the teacher's controlled activity, it functioned simultaneously as a form of cognitive self-scaffolding *for the teacher* and the discovery of a new way to scaffolding *the child*!

3.3.2. Bridging

The concept of *bridging* (Granott, Fischer, & Parziale, 2002) refers to the process by which individuals use partial knowledge to construct a target structure that helps *bridge the gap* between old knowledge and developing knowledge. Bridging arises from the capacity to function simultaneously at two developmental levels in one skill domain. In so doing,

a partially constructed representation of the goal state functions as a *shell* for creating new knowledge. For example, in a study in which a pair of adults observed the operation of self-moving robots in order to figure out how they worked (Granott, 2002), one person experimented by putting his hand around the robot as it moved. His partner noted: "Looks like we got a reaction there." In using the word "reaction," the partner made a vague reference to causality, but without specifying either cause or effect. In so doing, he created a shell postulating a link between two unknown variables, **X** and **Y**, and their relation:

(a) $[(X)\frac{\text{reaction}}{\text{SHELL}}(Y)]$.

This shell functioned as a skeletal outline of a to-be-constructed representation. In Granott's study, the dyad used this shell to guide their exploration. Further observations of the robots allowed the observers to establish a causal connection, thus filling in the shell. Specifically, the dyad noted that the robot's movements changed after it moved under a shadow. In this way, the dyad "fill in" the content of the shell identified in (a) to create a the following structure:

(b) [SHADOW <u>causes</u> CHANGE IN DIRECTION].

Thus, the dyad's use of the shell identified in (a) functioned as a bridge between the dyad's initial and final representations of the problem. In so doing, it operated as a type of self-scaffolding that helped the dyad bootstrap their knowledge to new developmental level.

3.3.3. *Analogical mappings*

Another form of self-scaffolding, closely related to bridging, involves *analogical scaffolding*. Using analogical scaffolding, a person draws upon existing representations of similar problems as an analogical guide to structure novel problem-solving activity. In their classic work, Gick and Holyoak (1980) demonstrated that participants provided with a series of strategies that were analogous to a to-be-solved problem were able to use the analogical strategies as guides to problem solving. Gick and Holyoak's (1980) research suggests, however, that the presentation of analogous problem-solving strategies does not guarantee spontaneous generalization to new and similar problems. Problem solvers engaged in analogical problem solving when they were alerted to possible links between multiple analogical strategies and target problems. As such, the use of analogies as a form of self-scaffolding might best occur when individuals are already aware of the links between existing strategies and novel problems. For example, a professor may compose a syllabus for a novel course by modifying an existing syllabus in a related course. In so doing, the old syllabus functions as an analogical guide for producing a new syllabus.

3.4. *Coaction, scaffolding and development*

The concept of scaffolding has proven to be a fruitful one in developmental psychology. The traditional concept of scaffolding is defined in terms of the structuring effects that other people have on children's actions. However, when one adopts the person–environment system as a basic unit of developmental analysis, it becomes apparent that there are many ways in which environmental elements can scaffold children's action. To profit from

this view, however, there is a need to make fine-grained moment-by-moment assessments of coactions among elements of the person–environment system in real time. The descriptions provided in this paper provide a starting point for launching such efforts. In so doing, a coactive systems model both extends and offers a more precise definition of the *scaffolding* than is normally invoked in the literature. Whether or not data like those discussed above lead scholars to retain, augment or discard the concept of scaffolding, such data suggest the need to contextualize developmental analyses by studying how meaning and action arise coactively over time within person–environment systems.

References

Adolph, K. E., & Eppler, M. A. (1998). Development of visually guided locomotion. *Ecological Psychology*, *10*, 303–321.

Bateson, G. (1972). *Steps to an ecology of mind*. New York: Balantine.

Butler, D. L. (1998). In search of the architect of learning: A commentary on scaffolding as a metaphor for instructional interactions. *Journal of Learning Disabilities*, *31*, 374–385.

Cazden, C. B. (2002). *Classroom discourse* (2nd ed.). Portsmouth, NH: Heinemann.

Clark, A. (1997). *Being there: Putting brain, body and world together again*. Cambridge, MA: MIT Press.

Cocking, R. R., & Renninger, K. A. (1993). *The development and meaning of psychological distance*. Hillsdale, NJ: Erlbaum.

Cowart, M. An analysis of scaffolding and its role in cognitive development. *International Journal of the Humanities*, in press.

Dennis, W. (1960). Causes of retardation among institutional children: Iran. *Journal of Genetic Psychology*, *96*, 47–59.

Fischer, K. W. (1980). A theory of cognitive development: The control and construction of hierarchies of skills. *Psychological Review*, *87*, 447–531.

Gauvain, M. (2002). *The social context of cognitive development*. New York: Guilford.

Gibson, J. J. (1977). The theory of affordances. In R. E. Shaw, & Bransford (Eds.), *Perceiving, acting, and knowing*. Hillsdale, NJ: Lawrence Erlbaum.

Gick, M. L., & Holyoak, K. J. (1980). Analogical problem solving. *Cognitive Psychology*, *12*, 306–355.

Granott, N. (1998). Unit of analysis in transit: From the individual's knowledge to the ensemble process. *Mind, Culture, and Activity*, *5*, 42–66.

Granott, N. (2002). How microdevelopment creates macrodevelopment: Reiterated sequences, backward transitions, and the Zone of Current Development. In N. Granott, & L. Parziale (Eds.), *Microdevelopment: Transition processes in development and learning* (pp. 213–242). New York: Cambridge University Press.

Granott, N., Fischer, K. W., & Parziale, J. (2002). Bridging to the unknown: A fundamental mechanism in learning and problem-solving. In N. Granott, & J. Parziale (Eds.), *Microdevelopment*. Cambridge, UK: Cambridge University Press.

Jones, K. S. (2003). What is an affordance? *Ecological psychology*, *15*, 107–114.

Kellman, P. J., & Spelke, E. S. (1983). Perception of partially occluded objects in infancy. *Cognitive Psychology*, *15*, 483–524.

Kirsh, D., & Maglio, P. (1994). On distinguishing epistemic from pragmatic action. *Cognitive Science*, *18*, 513–549.

Kitchener, K. S., Lynch, C. L., Fischer, K. W., & Wood, P. K. (1993). Developmental range of reflective judgment scores: The effects of contextual support and practice. *Developmental Psychology*, *29*, 893–906.

Mascolo, M. F. (2004). The coactive construction of selves in culture. In M. F. Mascolo, & J. Li (Eds.), *Culture and self: Beyond dichotomization. New directions in child and adolescent development series*. San Francisco, CA: Jossey-Bass.

Mascolo, M. F., & Fischer, K. W. (2005). Constructivist theories. In B. Hopkins, R. G. Barr, G. Michel, & P. Rochat (Eds.), *Cambridge encyclopedia of child development* (pp. 49–63). Cambridge, UK: Cambridge University Press.

Mascolo, M. F., & Margolis, D. (2005). Social meanings as mediators of the development of adolescent experience and action: A coactive systems approach. *European Journal of Developmental Psychology*, *1*, 289–302.

Rogoff, B. (1990). *Apprenticeship in thinking*. New York: Oxford University Press.

Salomon, G. (Ed.). (1993). *Distributed cognitions: Psychological and educational considerations*. New York: Cambridge University Press.

Siegler, R. S., & Jenkins, E. A. (1989). *How children discover new strategies*. Hillsdale, NJ: Erblaum.

Sigel, I. E. (2002). The psychological distancing model: A study of the socialization of cognition. *Culture & Psychology*, *8*, 189–214.

Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard.

Watson, J. S., & Ramey, C. T. (1972). Reactions to response-contingent stimulating in early infancy. *Merrill-Palmer Quarterly*, *18*, 219–227.

Wertsch, J. V. (1998). *Mind as action*. New York: Oxford.

Wertsch, J. V. (2002). *Voices of collective remembering*. Cambridge, UK: Cambridge University Press.

Wood, D. J., Bruner, J., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry*, *17*, 89–100.

Wood, D., & Middleton, D. (1975). A study of assisted problem solving. *British Journal of Psychology*, *66*, 181–191.