

formulation catches something of the intentionality of depiction.

What *Modularity* should have done is to grasp the intentionality issue, upgrade the analysis of the child's construction of psychology as I suggested earlier, and sweep into the net the emergence of the child's intentional theory. The clue to advance is given in: "To have theoretical status, knowledge must be encoded in a format usable outside normal input/output relations. It is these redescrptions that can be used for building explicit theories" (*Modularity*, p. 78). Therefore, let us not confine the study of pictorial reasoning to the normal output of picture production. Even preschoolers may have interesting hypotheses about how a picture serves to unite an artist, an observer, and the world in an intentional net (Freeman 1995). It is that terrain on which representational redescription can and should be tested.

## Do you have to be right to redescrbe?

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**Abstract:** Karmiloff-Smith's developmental perspective forces us to recognize that there are many levels at which knowledge can be represented. We first offer empirical support for a distinction made on theoretical grounds between two such levels. We then argue that "redescription" onto a new level need not await success (as Karmiloff-Smith proposes), and that this modification of the theory has important implications for the role redescription plays in development.

One of the many insights in Karmiloff-Smith's book is that development does not stop at behavioral mastery. For example, several years after children succeed at balancing a wide variety of oddly shaped blocks on a narrow support, they begin to make errors on the same task. They now ignore the proprioceptive cues used so effectively years earlier and are able to balance only those blocks with weight evenly distributed around their geometric center. Is this developmental progress?

Karmiloff-Smith says "yes." She argues that such changes in children's performance reflect the fact that they have begun to redescrbe that knowledge. In the process of redescrption, particular aspects of the "data" are highlighted (in this case, the geometric center of the block) and incorporated into a theory in action. Phenomena of this sort (and the book contains many compelling examples in a variety of domains) point to a level of representation in which certain aspects of the child's knowledge are explicitly defined. By "explicit" Karmiloff-Smith means that the information is no longer embedded in the special purpose procedures of the earlier period. This is the first step in making knowledge accessible beyond the particular task in which it was developed (level E1), the first step in the process called "redescrption."

**1. Gesture offers empirical support for a distinction made on theoretical grounds.** Studies of adults tend to distinguish two levels of knowing (implicit vs. explicit; unconscious vs. conscious; automatic vs. controlled). Karmiloff-Smith's developmental perspective, however, forces us to recognize that there are many levels at which knowledge can be represented. She distinguishes two levels beyond the first level of redescrption (level E1) – one in which knowledge is available to conscious access but not to verbal report (level E2), and one in which knowledge is available to both conscious access *and* verbal report (level E3). The book collapses the theoretical distinction between these two levels on the grounds that there is very little empirical research to support this claim. However, empirical evidence does exist for such a distinction. The evidence comes from gesture.

When children are able to conserve number on a Piagetian task, they often justify their correct responses with a verbal

rationale, and that verbal rationale is frequently accompanied by gestures that convey the same information. For example, a child might describe one-to-one correspondence between two rows of checkers in speech and simultaneously point out the same correspondence in gesture. Such a child would presumably be at level E3. However, even before children are able to express some concepts in speech, they may do so in gesture. For example, a child might persist in saying that one row of checkers is longer than the other, while at the same time pointing out a correspondence between the two rows in gesture (Church & Goldin-Meadow 1986). Such a child is not yet able to express verbally one-to-one correspondence, but the knowledge is still there, in some sense. The question, according to Karmiloff-Smith's formulation, is whether the knowledge is consciously available, as it ought to be to qualify for level E2. [See also Shanks & St. John: "Characteristics of Dissociable Human Learning Systems" *BBS* 17(3) 1994.]

"Consciously available" is, of course, a slippery term. Typically, speakers are not aware of the fact that they are gesturing as they speak (cf. McNeill 1992; indeed, gestures change in form and function if they become the focus of communicative attention; see Singleton et al. 1994). Consequently, if awareness is a requirement for consciousness, gesturing does not qualify. However, speakers *do* appear to have access to the information they express in gesture and, in this sense (a sense that we believe captures the essence of the distinction Karmiloff-Smith is making), information conveyed in gesture is "conscious." For example, we have presented to children a solution to a math problem and then asked them to judge whether the solution was an acceptable one for that problem. The solution presented was generated either by a procedure that the child had (on a pretest) expressed in gesture but not in speech, or by a procedure that the children had not expressed in either modality. Children were consistently more likely to accept solutions of the first type than of the second type (Garber et al. 1994; Goldin-Meadow et al. 1993), suggesting that they *did* have access to the information they conveyed in gesture, and that they were able to apply that information in a different context. Observations such as these provide evidence that some knowledge may be consciously available, though not able to be verbalized.

**2. When does redescrption begin, and what is it good for?** Our studies of gesture lead us to question a basic assumption of Karmiloff-Smith's theory – that the child must master a task before redescrption of that task can begin. According to the theory, redescrption starts with correct information (represented at the implicit or I level). The process takes this information and repackages it, highlighting certain aspects and omitting others, but it does not add new information. This repackaging leads to cognitive flexibility but does not, according to Karmiloff-Smith, affect behavioral mastery. Thus, the theory of redescrption has nothing to say about the long period of development *prior* to behavioral mastery. It might, however, if redescrption were not tied to behavioral mastery.

We suggest that behavioral mastery is not necessary for redescrption to occur. Well before children have mastered a task, they are able to articulate (in speech or gesture) beliefs about the task – which implies that redescrption has already gone on (e.g., Alibali & Goldin-Meadow 1993). It is, of course, possible that the child *has* achieved behavioral mastery by this time, and that we do not know how to tap into this knowledge. This, however, is a weak way to save the theory. Even Karmiloff-Smith herself suggests (in the *Précis*) that behavioral mastery may not be a prerequisite for redescrption.

This slight modification of Karmiloff-Smith's theory has obvious implications for the onset of redescrption and, less obviously, implications for the role that redescrption plays in development. When children are wrong, they are often systematically wrong; that is, their incorrect answers are consistent and make sense within their own framework. (This insight is one of Piaget's most important contributions to developmental psy-

chology.) Stable states such as these could well set the stage for redescription. We suggest, however, that redescription of incorrect knowledge could, in the end, be a destabilizing force. For example, a redescription resulting in newly framed explicit knowledge might feed back and encourage the child to alter implicitly encoded knowledge, particularly if that knowledge is incorrect or incomplete. If implicit knowledge is altered, what then happens to the redescriptions that were originally formulated from it? Once we allow the possibility of redescription of incorrect knowledge, we are forced to think about change – not only at the higher levels where the same information is repackaged, but also at the lower levels where new information may be added.

Although complicating Karmiloff-Smith's theory, our data suggest that redescription of incorrect knowledge does indeed take place. It seems to us likely that redescription begins whenever a stable state is achieved, be it a correct or incorrect stable state. As a result, you probably do not have to be right to redescribe – but if you are wrong, beware of the consequences.

### Dissociation, self-attribution, and redescription

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What's in a child? Karmiloff-Smith has written a book which may hold the answer. The book is first-rate, bold in conception, articulate in telling, and synoptic in evidential sweep. I want to comment on one and only one theme within it, although it is a big one, that of representational redescription. And I want to focus on only one topic within that theme, although it is a topic capable of bubbling over into other themes.

Karmiloff-Smith claims that information in a child, including information about the child's own mind, can become progressively explicit to that child, and once explicit it may be deployed by the child in understanding self and world. Karmiloff-Smith calls this claim the representational redescription hypothesis. The information may be relatively confined to specific areas of knowledge: number, language, human psychology, and so forth. Such confinement she dubs "domain specificity." Information may cross domains at different phases of development. There may also be domain-specific damage in the form of degraded or destroyed information or computational capacities within a domain.

Why does Karmiloff-Smith call information in a child which has become explicit to the child "redescribed representation"? At first I was confused by this locution, for when a child has information only inexplicitly or implicitly, the information is not described by the child. So the coming to be of explicit information seems synonymous with coming to describe (not redescribe) one's otherwise implicit information. Her hypothesis should really be called the representational description hypothesis.

So I thought – but then I discovered the wisdom in the phrase. For Karmiloff-Smith, exploiting internal information, making it explicit, is not an all-or-none affair. Information becomes progressively more explicit, in phases, fits, starts and stops, and in chunks, the normatively ideal end result being representational flexibility and control. No single description may or even should satisfy the child. One and the same segment of information may be described and used in different ways, at different times, for different purposes. Dynamically understood, the best term for the affair is "redescription."

My question concerns a form of redescription to which young children seem particularly prone or vulnerable, that is, the process of dissociating themselves from their own minds by linking or attributing their own mental states to other minds or

selves both real and imaginary. Children "play tricks" with imaginary playmates and even with themselves.

Sadly, dissociation may be anything but playful. It can be tragic. Consider, by means of illustration, the following influential explanatory hypothesis for the childhood origins of multiple personality disorder or MPD (Rhue & Lynn 1991).

Childhood abuse is a developmental antecedent common in cases of MPD. Some abused children may use dissociation as a psychic safety valve to minimize negative affect (guilt, anger, anxiety) and to avoid conflict. They may invent or construct personae that enable them to disavow engagement in abusive parental relations. These personae, or believed-in other selves, create a credible sense of separation or personal distance from subjective involvement in such relations.

For Karmiloff-Smith, powers of fantasy and imagination (including, arguably, the tendency to dissociate) are central catalysts in the dynamic process of representational redescription. As cases of nascent MPD and other dissociation phenomena reveal, making information in the child explicit to the child is not necessarily making this information explicit for the child as the child's. The move from implicit to explicit – the process of representational redescription – allows children to attend to their own states of mind but this may happen without their acknowledging or realizing that such states truly are their own. Redescription is one thing; self-attribution of explicit information about the self is another.

Karmiloff-Smith notes that "children spontaneously seek to understand their own cognition" (p. 192). She notes that this allows them to become folk psychologists. Alas, however, it also allows them to become folk psychopathologists, as it were, so that in order to keep pain at bay they may distance themselves from information about themselves. Dissociation prevents information in the child from being (what may be called) self-referentially available. As such, it represents a departure from the normative ideal of representational flexibility and control. More exactly, dissociation may be locally adaptive by enabling a child to adapt to a current crisis but globally dysfunctional by undermining the child's ability eventually to face adult demands and responsibilities.

Throughout her chapter (Ch. 5) on the child as psychologist, Karmiloff-Smith, to her credit, talks about children coming to terms with their own attitudes and with the contents of those attitudes. What is missing in Karmiloff-Smith's discussion is recognition of a special form of metacognitive achievement, namely knowing my mind as mine, and the role this form may play in cognitive development. This is a topic on which I have ruminated (Graham & Stephens 1994; Stephens & Graham 1994), and which, if I am right, deserves the attention of cognitive scientists in general and developmentalists in particular.

It remains an open question how the theory of representational redescription may describe or explain the achievement of self-attribution, and what role the phenomenon may play in the emergence of representational flexibility and control. Having acknowledged the existence of childhood dissociation, what lessons should a Karmiloff-Smith-inspired theorist draw? One lesson has just been mentioned: making internal information explicit to the child is not necessarily making the child's own self explicit for the child. Self-attribution is a separable achievement. Another lesson concerns the fragility of self-explicitness and self-attribution. In line with Karmiloff-Smith's views of the progressive and fitful emergence of explicitness, self-attribution does not appear as a sudden takeover of the child's own internal information; it more closely resembles a long and slowly maturing process, vulnerable to breakdown, and compounded by a need for constant reconstitution.