DeLoache, J.D. (2004). Becoming symbol-minded. *Trends in Cognitive Sciences, 8,* 66-70.

Brief description:

i. Definition of 'symbols': *a symbol is something that someone intends to represent something other than itself* (p. 66)
ii. A vital function of symbols is to enable humans to learn about things without directly experiencing them
iii. Competence with symbols is necessary to be a fully functional member of society
iv. Becoming symbol-minded is what set humans apart from great apes, and the process of becoming symbol-minded comprises much of early development

Dissecting the definition:

i. *someone*: humans are the only symbolic species (p. 66)
ii. *something*: anything can represent anything else (p. 67) (iconicity not an issue)
iii. *intends*: nothing is inherently symbolic; a person must intend that one entity represent another for a symbolic relation to be established (p. 67)
iv. *represent*: symbols are not associated with their referents, they are *about* them
v. *other than itself*: symbols are objects of contemplation and communication, not action (p. 68)

Empirical support for the definition:

i. Humans are able to interpret things symbolically:
    1. 'whisk' study (p. 67). Children learn about 'whisk' through a line drawing (symbol), but are able to select a real 'whisk' (referent) when asked for one.
        -Suggests that they interpreted the picture of the whisk as a representation of something else. But, this is a language task. What about evidence of symbolic interpretations in other domains?

ii. Anything can represent anything else:
    1. sign language studies (p. 67). Infants and preverbal children readily accept a variety of verbal and nonverbal labels for objects
        -But as early as 20 months, children begin to display preferences for spoken words. Something unique about language?

iii. Symbols are intentional:
    1. toddlers only learn novel words as labels for unfamiliar objects when the speaker is present and looking at the object
    2. two and three year-olds reject an image that they believe was produced accidentally, but consider the same image to be a picture of something when told that it was created intentionally
    3. children produce pictures that are visually similar, yet they insist that they represent distinct objects (balloons and lollipops)
    4. children produce clearer drawings when told that they will be used to teach adults about how to play a game
        -Do these studies reflect intentional symbol matching, or general human tendencies toward effective social communication and probabilistic pattern matching?

iv. Symbols refer to something else:
    1. 9-month olds manually explore realistic pictures as if they were objects themselves, but by 18 months, treat pictures symbolically
    2. model task: increasing physical salience of the model leads to decrements in performance

Clark, A. (2006). Language, embodiment, and the cognitive niche. *Trends in Cognitive Sciences, 10,* 370-374.

Brief description:

i. Language is a special type of symbol system that allows us to think and reason about things we have not experienced

ii. Using language provides humans with a new realm of perceptible material on which basic cognitive processes can act

iii. 'Thinking about thinking' is what makes us distinctly human, and this ability is directly supported by language

iv. Language is as much an aspect of thinking as a result, and forms part of the thinking process

Dissecting the argument:

i. The 'cognitive niche': Language is a special type of symbol system

1. Materiality of language, as sounds in the air or words on the page, allows it to serve as both representations of objects and concepts and irreducible items in its own right

-Sheba the chimpanzee: flexibly adapts to pointing to the smaller pile of food only when provided with number labels on food containers. Numeral is stripped of perceptual temptations of the food pile, making it easier for Sheba to select and execute the weaker behavioral response.

ii. Humans benefit from targeting basic, general cognitive mechanisms on language

1. Presence of material symbols lessens the computational burdens for certain kinds of tasks

-Words and labels in contextual object learning trains processes of attention for faster category learning

iii. The 'cognitive super-niche': Language enables 'thinking about thinking', and imagining things we have not experienced, and this system is infinitely productive

1. Trying to form a mental image of '98-ness' without a number word

-Dehaene: # words give us the ability to form an unlimited set of exact quantities

2. Writing to formulate a thought

-stable, attendable structure to which further subsequent thinkings can then attach

3. Jackendoff: is mental rehearsal the only means by which we can execute introspection?

4. Clark: thinking about thinking is a "good candidate for a distinctively human capacity", and cannot be accomplished without language

iv. Language directly influences the process of thinking itself

1. Language is not "translated" into Mentalese (Fodor), it acts directly

2. Words as "anchors" or "fulcrums of attention" to stabilize and discipline the intrinsic dynamics of thought and reason

3. Advanced thought and reason require the ability to tame and discipline our "biologically more 'natural' processes" of representation, reason, and recall—language can do this

4. No Central Meaner, no inner code, no Pure Translation—language in embodied agents acts as a causal, interactive component of the larger, self-organizing machinery

Points of contrast between DeLoache and Clark:

-Social perspective versus information processing perspective

-Directness versus indirectness

-Symbol-grounding problem and the homunculus argument

-How extensive is the role of symbols in cognition?