COMMENTARIES

What would a theory of conversational awareness look like?

Janet Wilde Astington

University of Toronto, Canada

Siegal (e.g. 1991, Siegal & Peterson, 1994) has long argued that data from conversations with young children in experimental settings must be treated with caution. If the child does not understand and share the experimenter's purpose he or she may provide irrelevant responses – irrelevant, that is, to the scientific endeavour of determining what the child knows. This is a valid methodological point, and indeed, Siegal's work over the past decade has helped to demonstrate its importance. The present contribution promises to go further, however. Siegal argues that children's interpretation of test questions is of more than merely methodological concern, such that there needs to be a 'radical shift in cognitive developmental theory and research to account for the importance of children's conversational awareness' (p. 2). This is stirring stuff, and I read the paper with some anticipation. Unfortunately, however, Siegal fails to deliver. We learn again that young children are confused by violations of Gricean maxims and we are again provided with examples of their competence when test questions are used that do not require the interpretation of conversational implicatures. However, Siegal's theory of conversational awareness is never clearly spelled out.

First, there is some confusion whether 'conversational awareness' refers to children's pragmatic or metapragmatic ability. Siegal writes, 'Piaget never defined conversation itself as a domain of knowledge even though how children understand the conversation initiated by experimenters is central to their performance on cognitive developmental tasks' (p. 2). 'Understanding conversation' is pragmatics, whereas 'conversation as a domain of knowledge' is metapragmatics. A theory of conversational awareness should, I would argue, include both but they need to be clearly distinguished.

Children's pragmatic abilities begin very early in life. I disagree with Siegal's contention that our everyday conversations with young children do not violate Gricean maxims. Even very young children can respond to indirect requests and participate in teasing and jokes (Dunn, 1988). They will even respond to 'known answer' questions when we want them to display their competence for admiring onlookers or in bookreading sessions. What young children lack is knowledge of the wider world, including the world of experimental psychology where people present tasks as 'games' but none the less want serious answers to their questions. I agree that young children do not share the experimenter's purpose here but this is not a failure of their pragmatic ability. We would not expect them to share it. The skill in working with young children is to get the information we want from them without their sharing our purpose. This is where methodological expertise comes in.

However, Siegal aims to go beyond methodological concerns in accounting for the importance of children's conversational awareness to their cognitive development. Although not specifically stated, the implication is that conversational awareness plays a fundamental causal role in conceptual change. This awareness appears to depend on children's awareness of their own and others' intentions and beliefs. A great deal of research in developmental psychology over the past two decades has been devoted to investigating the development of this understanding, under the rubric of 'children's theory of mind'. It may be that Siegal's proposed 'theory of conversational awareness' is meant to encompass a theory of the child's theory of mind. We need to know how it differs from other such theories and what its predictions are. Elsewhere (Siegal & Peterson, 1994), Siegal has said that children who have more experience of conversations perform better on false belief tests because of these experiences. But these conversations also provide children with the semantics of mental terms and the syntax of complementation – both factors which others have argued are fundamental to false belief understanding (Astington, 1996; de Villiers & de Villiers, in

Address for correspondence: Institute of Child Study, OISE, University of Toronto, 45 Walmer Road, Toronto, Ont MSR 2X2, Canada.

press). In order to assess the specific contribution of conversational awareness to the development of false belief understanding, we need to pull apart these interconnected aspects of linguistic development.

More broadly, however, in order to assess the importance of conversational awareness that goes beyond methodology, we need to know what specific contribution this awareness makes to conceptual development in other areas. Can we measure it, independent of syntax and semantics, and show that good conversationalists succeed sooner on Piagetian tests of conservation, for example? It may be here that metapragmatics comes in. Pragmatic ability is the ability to use language in communication while metapragmatic ability is the ability to reflect on such usage. I agree, as Siegal does, with Lourenço and Machado's (1996) argument that children's capacity to justify their judgments is an important part of their cognitive competence. The ability to provide such justifications depends on their reflective awareness (Karmiloff-Smith, 1992). It may well be possible to show that there is a relation between children's metapragmatic ability and their ability to justify their responses in experimental tasks. Admittedly, this is no evidence for the causal efficacy of conversational awareness. Such evidence would be harder to come by – this, however, is what is required, if we are to show that conversational awareness makes a unique contribution to cognitive change.

References

Astington, J. (1996). What is theoretical about the child's theory of mind? A Vygotskian view of its development. In P. Carruthers & P.K. Smith (Eds), *Theories of theories of mind* (pp. 184–199). Cambridge: Cambridge University Press.

Dunn, J. (1988). *The beginnings of social understanding*. Cambridge, MA: Harvard University Press.

Karmiloff-Smith, A. (1992). *Beyond modularity: A developmental perspective on cognitive science*. Cambridge, MA: MIT Press.

Lourenço, O., & Machado, A. (1996). In defense of Piaget's theory: a reply to 10 common criticisms. *Psychological Review*, **103**, 143–164.

Siegal, M. (1991). *Knowing children*. Hove, UK: Erlbaum.

Siegal, M., & Peterson, C.C. (1994). Children's theory of mind and the conversational territory of cognitive development. In C. Lewis & P. Mitchell (Eds), *Children's early understanding of mind* (pp. 427–455). Hove, UK: Erlbaum.

de Villiers, J.G., & de Villiers, P.A. (in press). Linguistic determinism and the understanding of false beliefs. In P. Mitchell & K. Riggs (Eds), *Children's reasoning and the mind*. Hove, UK: Psychology Press.

Assessing links between conversational awareness and cognitive development

Michel Deleau

University of Rennes 2, France

In his paper, Siegal presents two major series of data. The first is that preschool children interpret the ('scientific') questions they are addressed as if the interview occurred in the same forms and with the same stakes as in everyday conversations; and consequently they answer with their misunderstanding of the speaker's intentions. The second is that the limitation of conversational experience – as in the case of deaf children of hearing parents – leads to delays in specific areas of cognitive development.

Both contribute to supporting the general claim that the variations in children's performances are not 'merely methodological' but reveal that children use interpretive rules rooted in their conversational experience to elaborate their responses to any clinical and experimental device, and that their knowledge of 'conversational logic' interferes with their conceptual knowledge. My contribution will focus on the status of this interference, and on the possible strategies to check its consequences empirically.

Address for correspondence: University of Rennes 2, 6 avenue G. Berger, F-35043 Rennes, France; e-mail: michel.deleau@uhb.fr

In the first part of the argument, the analysis of Piagetian interviews clearly indicates that there are conversational obstacles to the assessment of conceptual knowledge. Other studies provide the reciprocal information: each time the child does not have too many implicatures to manage and has a clear view of the speaker's intention (i.e. she is offered more linguistic cues, or experiences a cooperation with the speaker...), she expresses a higher level of cognitive achievement. Thus, the studies presented support the claim that the child processes the conversational information embedded in the experimental or clinical settings. They illustrate quite well also that if the child is naïve in interpreting an experimenter's intention, the adult is also naïve when he considers that his intentions are immediately clear to someone else! Thus communication problems extend much beyond simple technical biases: they imply the communication contracts underlying social relations.

However, the studies that are reviewed do not indicate that the conversational resources embedded in the interview contribute to the *construction* of the conceptual knowledge on which the interview is focused. In order to do this, one must relate conversational awareness to the mastery of specific pieces of conceptual knowledge. The second argument illustrates such a possibility: Siegal establishes a link between the reduction of conversational experience and the developmental delay in the construction of the concept of belief. This argument is more appropriate for defending the general thesis of a causal contribution of communication to conceptual development.

There remain nevertheless important questions to be answered. Actually, considering deafness in general is not sufficient to identify what the 'critical ingredients' of the conversational experience are that may contribute to conceptual development. One can think of three different ways in which this contribution may occur. The first and simplest is to consider conversation as a general source of stimulation. Here, the delay presented by deaf children would be a consequence of an impoverished social environment. A second possibility is to consider that conversations are specific events where the child comes across information on the folk psychology of her culture, is told about mental states and the causal links between mental states and behaviour. In that case, it is the *content* of conversations that should be connected with the building of a theory of mind, as in the studies of Dunn, Brown, Slomkowski, Tesla & Youngblade (1991). The third possibility is to consider that the child herself is a conversationalist and is engaged everyday in the management of intentions and beliefs. Here, the child builds a general social understanding (Astington & Olson, 1995) through her engagement in social practices, especially in narrativizing practices (Nelson, Plesa & Henseler, 1998). In this framework, the child experiences in conversations the difficulties of establishing and maintaining a joint reference and learns how to use discursive devices to do so. Thus the late mastery of the concept of belief may be related to this specifically human experience as Harris (1996) suggested.

Although all three hypotheses could explain in some respect the difficulties of deaf children, there is no doubt within the context of the paper that Siegal's argument is related to this third one. Assessing causal links implies here establishing empirical relations between the mastery of discursive devices (what might instantiate levels of conversational awareness) and performances in theory of mind tasks. I would like to discuss this with two illustrative proposals.

The first is provided by research on deaf children's performances in belief attribution tasks where the developmental delay varies depending on the experimental procedure that is used. In one of our studies (Deleau, 1998), where the child herself (and two experimenters) are the actors instead of the customary characters, deaf children of hearing parents passed the prediction test with a mean age of 7;10, about three years before comparable Australian children in the study of Peterson and Siegal (1995). The origin of this difference might reside in that the classical test of false belief implies a double reference system: that of the actual discourse between the child and the experimenter, and that of the story-telling about Maxi (or Ann and Sally). Comparatively, in our study, the presentation implies only the first one. If this is the case, succeeding in the classical presentation implies the capacity to maintain two simultaneous reference systems. One should find a similar difference when comparing the two devices with young hearing children.

Extending that view would lead to assessing more generally both the pragmatic knowledge of the child and her performance on theory of mind tasks. For example, anaphoric pronouns are used habitually to maintain a referent that has been previously introduced in discourse and is considered as a shared belief. One supposes that a child who uses anaphoric pronouns adequately masters at least some aspects of the concept of belief; and that should be revealed by the capacity of this child to refer to other's beliefs when confronted with explanation or prediction tasks.

Thus, Siegal's proposal is a very stimulating one. It opens a series of theoretical discussions and empirical inquiries about the links between communication and cognition. At the very least, it allows us to consider, in

Astington and Olson's words, that elaborating a theory of mind needs more than an intact brain and a necessary but limited social experience.

References

Astington, J.W., & Olson, D.R. (1995). The cognitive revolution in children's understanding of mind. *Human Development*, **38**, 179–189.

Deleau, M. (1998). Entre l'acte et la pensée: de l'activité conjointe aux symboles et aux croyances. *Enfance*, **1**, 37–47.

Dunn, J., Brown, J., Slomkowski, C., Tesla, C., & Youngblade, L. (1991). Young children's understanding of other people's feelings and beliefs: individual differences and their antecedents. *Child Development*, **62**, 1352–1366.

Harris, P. (1996). Desires, beliefs and language. In P. Carruthers & P.K. Smith (Eds), *Theories of Theories of Mind* (pp. 200–220). Cambridge: Cambridge University Press.

Nelson, K., Plesa, D., & Henseler, S. (1998) Children's theory of mind: an experiential interpretation. *Human Development*, **41**, 7–29.

Peterson, C., & Siegal, M. (1995). Deafness, conversation and theory of mind. *Journal of Child Psychology and Psychiatry*, **36** (3), 459–474.

Siegal on Piaget's legacy: Gricean child meets blundering experimenter

Angeline S. Lillard

University of Virginia

Siegal proposes that much research in cognitive development is inadequate, in that it assumes children to be more adept at figuring adults' purposes in conversation than they actually are. Siegal's assertion that experimenters must carefully consider how participants construe the experimental situation goes without saying, and no developmental psychologists worth their salt would deny it. Within that frame, however, Siegal makes objectionable arguments. Specifically, he claims that by age 3, children expect adults to adhere to Grice's (1975) four maxims (quantity, manner, relation, and quality). For example, when an adult experimenter asks children if they would like a contaminated drink, Siegal claims children say 'yes' despite their knowing the drink is not good, because they expect adults to be sincere in conversation (Grice's quality maxim) (Siegal, 1996, p. 253). Siegal suggests that his own experiments conform to children's expectations about conversations, and therefore truly tap cognitive development. However, he never investigates directly whether children expect experimenters to adhere to the maxims, and there are many other possible reasons why children perform better on his tasks.

The work by Siegal and Share (1990) exemplifies the weakness of Siegal's claims. In this study, children who had seen a cockroach removed from some juice were asked if the juice was okay or not okay to drink. This contrasts in many ways with the earlier studies by Rozin and his colleagues (Rozin, Fallon & Augustoni-Ziskind, 1985) which they were attempting to improve on. In the Siegal and Share study, children were in a school snack setting when the experimenter said, 'Here's some juice. Oh! It has a cockroach in it', and then removed the cockroach from a single glass of juice (presumably several other glasses were available). Rozin *et al.*'s study had only a single glass of juice, and used different contamination items (a comb, for example), setting (lab), type of stimulus (pictures) and test questions ('Would you like to drink this juice?'). Any of these factors might be responsible for improved performance; the test question may well have helped, but not necessarily because of the quality maxim. Another likely possibility is that children performed better because they realize, in a comparative context, that juice that has had a bug in it is *relatively* 'not okay'; maybe they would consider the contaminated juice to be okay if no other juice were available. Alternatively, one could turn

Address for correspondence: Department of Psychology, Gilmer Hall, University of Virginia, Charlottesville, VA 22903-2477, USA; e-mail: lillard@virginia.edu

Siegal's own arguments on his design. He has claimed for other studies that children think, 'She would not have asked me about lying if lying had not occurred' (Siegal, 1995, p. 179). Perhaps here children think, 'She would not ask if it was not okay to drink unless it was not okay'. Although children's responses to later questions were consistent and perhaps showed understanding, the questions came in a fixed order, and responses to later questions might be guided by responses to earlier ones.

In sum, we cannot assume when children perform differently with very different methods that we know exactly what features of the altered methods are responsible. Siegal claims it is his own conformance to Grice's principle, but there are many other possibilities, and he has not directly examined children's adherence to Grice's maxims. Next I examine Siegal's arguments with regard to the other three maxims, and end with a note on cultural issues.

The maxim of relation

Grice's maxim of relation specifies that speakers should be relevant and informative. Siegal takes 'relevance' in an odd way: that the experimenter converse on a topic that is relevant to children (like food safety). The more common interpretation is that each speaker turn should be relevant to the ongoing conversation (Clark & Clark, 1977; Levinson, 1983; Akmajian, Demers & Harnish, 1984). Collective monologues, for which young children are famous, violate the maxim. That point aside, the notion that experimental tasks should be geared to children's concerns is important, and I think is reflected in the fact that cognitive development labs are usually stocked with toys and other items that seem to matter to children. Siegal uses the domain of food contamination as one of particular relevance to children, and claims to find in this domain early appreciation of the appearance–reality distinction (the cockroach study just described).

Again, other factors reasonably explain why children do better with his study. Focusing now on his claim that he has found a more relevant circumstance under which children pass appearance–reality tasks earlier, one should note that Siegal does not even test the appearance–reality distinction as Flavell and his colleagues (Flavell, Green & Flavell, 1986) have defined it. Appreciating that a glass of juice that used to have a cockroach in it would not be so good to drink, despite its looking just fine, is in no way the same as understanding that a deceptive object, like a candle-apple, can in effect have two identities. As Woolley and Wellman (1990) have discussed, Flavell and his colleagues were posing a much tougher problem. Siegal and Share's task is not even parallel, so there is no evidence to support his claim that children can make the distinction as Flavell *et al.* defined it.

The maxim of quantity

The maxim of quantity specifies that one should speak no more or less than is required. Siegel claims that when adults ask a second question during experimental procedures they violate the quantity maxim, leading children to ask themselves, 'Why would (the experimenter) ask me again? She must want me to change my mind' (Siegal, 1996, p. 251). One need only point to the many experiments in which children do not change their answer to a second question for evidence that this is not an overriding tendency. Looking again at Flavell *et al.*'s appearance–reality studies (see also Flavell, Flavell & Green, 1987) children respond in the *same* way to both questions; they do not change their answer to the second question until they are 4 years old. Recent experiments by Amsel also show children answering subsequent questions in the same way (Amsel & Smalley, in press). In the Smarties version of false belief tasks, the child is asked both what they themselves and what someone else first thought was in a box, and young children tend to respond in the same way to both questions (Gopnik & Astington, 1988). As a final example, in experiments by myself and Flavell, children gave the same answer to two questions about someone's belief and reality, but gave different answers to two questions about someone's desire and reality (Lillard & Flavell, 1992). The experimental situation was identical in form and differed only in content (belief versus desire), and children's response patterns differed. Many other examples in the literature indicate that children's poor performance in some studies cannot be explained as their assuming they should change their answer to subsequent questions.

The maxim of manner

Grice's maxim of manner says that one should avoid ambiguity and be brief and orderly. Siegal claims that false belief task questions are temporally ambiguous, and this is why children fail them (Siegal & Beattie, 1991). His research team has asked instead, 'Where will Maxi [or the equivalent] look *first* for his chocolate?', and has found that young children performed much better, in some experiments. However, many experiments using the Smarties task have asked children what they thought

was in the box when they *first* saw it, to no effect; indeed, a recent meta-analysis by Wellman and his colleagues (Wellman, Cross & Watson, in preparation) finds no assisting effect of temporal specifiers in false belief tasks. Hence Siegal's assumption that ambiguity (about when Maxi is looking for his chocolate) causes poor performance does not hold up across tasks.

Siegal (1996) cites Clements and Perner's (1994) demonstration that young children look at the correct (first) location, but still reply verbally according to the second location, as supporting his contention that they do understand false beliefs and that most experimenters simply ask ambiguous questions. However, in the Clements and Perner study, we do not know what looking means. One strong possibility is that children are simply rerunning the entire story in their minds before answering. Perhaps in the Siegal paradigm as well, children respond according to the first place Maxi saw the item. Finally, with regard to ambiguity, one can look to several studies in which desire and belief tasks were kept parallel, and the very same children failed belief versions yet passed desire versions of those tasks (Wellman & Woolley, 1990; Gopnik & Slaughter, 1991; Lillard & Flavell, 1992). These are against the claim that children's failure is simply a matter of ambiguous questions.

Cultural issues

The logic underlying Siegal's argument is that Grice's maxims are universal, adhering to natural laws of conversation. This is itself contestable. Keenan (1976) discussed at length how the maxims were not valid for the Malagasy. For example, she says Malagasy people do not want to be guilty of telling falsehoods when information is not right, and therefore they tend to reply ambiguously a good deal of the time. I suspect a strong argument could also be made against the maxim of manner in Japan: several writers discuss how the Japanese language thrives on ambiguity (Doi, 1974; Sakamoto & Naotsuka, 1982; Clancy, 1986). Speakers prefer to be ambiguous so as not to directly contradict the feelings of the conversational partner; speaking directly is offensive.

If there is cultural variation surrounding Gricean maxims, then children must learn them, and the age at which they do so would have direct bearing on Siegal's arguments. Very young children who are learning words certainly do not seem to tire of our violating the maxim of quantity when we ask them over and over 'What's that?' and expect them to supply labels, *ad nauseum*, for objects that we well know the label for. This brings us back to the issue of what children expect when in conversation. We do not know that children are doing all the guesswork that Siegal attributes to them; it may well be that they are simply answering our questions, not trying to figure out our purposes at all.

Siegal's message that experimenters should be cautious in developing procedures, so that procedures make sense to and for participants, is certainly true. And there certainly are cases in which insensitive experimenters have obtained invalid results because they have not attended to how participants construe the experimental situation. However, the particular ways in which Siegal claims children misjudge experimenters' questions are only guesswork with an *ad hoc* flair; more convincing demonstrations are needed before one can justly claim that Gricean maxims are at issue.

Acknowledgements

I am grateful to Jacqui Woolley for comments on an earlier draft of this commentary. This work was supported by NSF Grant #DGE-9550152.

References

Akmajian, A., Demers, R.A., & Harnish, R.M. (1984). *Linguistics: An introduction to language and communication*. Cambridge, MA: MIT Press.

Amsel, E., & Smalley, J.D. (in press). Beyond really and truly: children's counterfactual thinking about pretend and possible worlds. In E. Riggs & P. Mitchell (Eds), *Reasoning and the mind*.

Clancy, P.M. (1986). The acquisition of communicative style in Japanese. In B.B. Schieffelin & E. Ochs (Eds), *Language socialization across cultures* (pp. 213–250). Cambridge: Cambridge University Press.

Clark, H.H., & Clark, E.V. (1977). *Psychology and language*. New York: Harcourt Brace Jovanovich.

Clements, W.A., & Perner, J. (1994). Implicit understanding of belief. *Cognitive Development*, **9**, 377–395.

Doi, T. (1974). Some psychological themes in Japanese human relationships. In J.C. Condon & M. Saito (Eds), *Intercultural encounters with Japan: communication-contact and conflict*. Tokyo: Kodansha.

Flavell, J.H., Flavell, E.R., & Green, F.L. (1987). Young children's knowledge about the apparent–real and pretend–real distinctions. *Developmental Psychology*, **23**, 816–822.

Flavell, J.H., Green, F.L., & Flavell, E.R. (1986). Development of knowledge about the appearance–reality distinction. *Monographs of the Society for Research in Child Development*, **51** (1, Serial No. 212).

Gopnik, A., & Astington, J.W. (1988). Children's understanding of representational change and its relation to the

understanding of false belief and the appearance–reality distinction. *Child Development*, **59**, 26–37.
Gopnik, A., & Slaughter, V. (1991). Young children's understanding of changes in their mental states. *Child Development*, **62**, 98–110.
Grice, H.P. (1975). Logic and conversation. In P. Cole & J. Morgan (Eds), *Syntax and semantics*, Vol. 3: *Speech acts*. New York: Academic Press.
Keenan, E.O. (1976). The universality of conversational postulates. *Language in Society*, **5**, 67–80.
Levinson, S.C. (1983). *Pragmatics*. Cambridge: Cambridge University Press.
Lillard, A.S., & Flavell, J.H. (1992). Young children's understanding of different mental states. *Developmental Psychology*, **28**, 626–634.
Rozin, P., Fallon, A., & Augustoni-Ziskind, M. (1985). The child's conception of food: the development of contamination sensitivity to 'disgusting' substances. *Developmental Psychology*, **21**, 1075–1079.
Sakamoto, N., & Naotsuka, R. (1982). *Polite fictions: Why Japanese and Americans seem rude to each other*. Tokyo: Kinseido.
Siegal, M. (1995). Becoming mindful of food and conversation. *Current Directions in Psychological Science*, **4**, 177–181.
Siegal, M. (1996). Conversation and cognition. In R. Gelman & T. Au (Eds), *Perceptual and cognitive development. Handbook of perception and cognition* (pp. 243–282). San Diego, CA: Academic Press.
Siegal, M., & Beattie, K. (1991). Where to look first for children's knowledge of false beliefs. *Cognition*, **31**, 1–12.
Siegal, M., & Share, D.L. (1990). Contamination sensitivity in young children. *Developmental Psychology*, **26**, 455–458.
Wellman, H.M., Cross, D., & Watson (in preparation). The truth about false belief: a meta-analysis.
Wellman, H.M., & Woolley, J.D. (1990). From simple desires to ordinary beliefs: the early development of everyday psychology. *Cognition*, **35**, 245–275.
Woolley, J.D., & Wellman, H.M. (1990). Young children's understanding of realities, non-realities, and appearances. *Child Development*, **61**, 946–961.

Rich conversation but vague theory

Orlando Lourenço[1] and Armando Machado[2]

1. *University of Lisbon, Portugal*
2. *Indiana University, USA*

Siegal calls our attention to conversation as a domain of knowledge and to its influence on children's cognitive development. His attempt to integrate theoretically data from several developmental domains (conservation, contamination sensitivity, suggestibility, and theories of mind) is noteworthy; his rich view of the social interactional context is commendable; and his statement that what develops in children's cognition is an interplay between conversational and conceptual processes is indisputable. Siegal's ultimate goal, however, is far more ambitious, for he wants to show that the accumulating body of evidence from his research on cognition and conversation challenges the core of the Piagetian paradigm as well as some aspects of its defense by Lourenço and Machado (1996). Unfortunately, here Siegal claims more than he is entitled to. As we shall see, his theory is vague, his reasoning is circular, his methodology is equivocal, and his arguments are biased. In the end, Siegal's ideas and findings challenge more his narrow reading of Piaget's theory than the theory itself.

The most serious problem with Siegal's account is that it assumes that children fail to give correct responses because some conversational rule was violated but it does not specify clear criteria to ascertain whether a rule was effectively violated; it does not assess rule violation independently of the behavior to be explained; and it does not explain how the violation of the rule leads to the child's specific answers. That children may misunderstand, be confused, or in the extreme mystified with the experimenter's questions is obviously possible. However, Siegal provides no evidence that that was indeed the case. In the absence of clear criteria for rule violation, Siegal can only guess – just count the number of times he says that children may assume, may interpret, may respond, may etc. Furthermore, to invoke a verbal misunderstanding to explain a child's answers requires, at a minimum, that the evidence for the misunderstanding be independent of the answers themselves, lest our reasoning be plainly circular. Siegal provides no such evidence. Hence, his presupposition

Address for correspondence: Orlando Lourenço, Faculdade de Psicologia, Alameda da Universidade, 1600 Lisboa, Portugal; e-mail: Orlando@fc.ul.pt

that young children engage in private and complex monologues (e.g. 'I am to pick the longer row as having more, or else an adult would not have gone to the trouble of asking me a second time whether that row has more') remains just that, *his* presupposition. But let us pretend that Siegal had somehow established rule violation on the basis of clear and independent criteria. His account would still be unacceptable, though, because it does not derive the content and form of pre-operational answers from the putative misunderstandings, confusions and mystification. The reader may search for the logic to move from a violation of the quantity maxim, for example, to the specifics of the child's answer and the content of supporting arguments; he may search, but he will not find.

Siegal's conservation tasks are also equivocal. First, because children (or puppets) cannot give 'nonconservation' responses and yet be consistent across questions, the task confounds response consistency and conservation, only one of which is central to Piaget's theory. Siegal (1997) seems fully aware of this problem, for he notes 'that no necessary connection exists between children's own answers on conservation tasks and their attributions for others' responses' (p. 23). Yet, that has not refrained him from claiming that his findings are highly damaging to Piagetian theory. Second, Siegal's experiments on conservation (e.g. Siegal, Waters & Dinwiddy, 1988) are permeated by conversational ambiguity, for they generally start by asking young children to indicate which of two rows 'has more elements' when in fact there is the same number in each row. Parenthetically, this ambiguity not only violates maxims of quality, relation and manner, but is also at odds with Siegal's intention to re(create) an ambiguity-free conversational act.

Siegal's arguments are at times uninformed and unbalanced, and thus biased. He fails to recognize that (a) the literature on moral development is replete with examples in which young children maintain their initial judgments and justifications under repeated questioning; (b) many adults fail formal tasks, and yet they are experienced conversationalists; (c) to appeal to a clash of conversational rules in many Piagetian tasks (e.g. imagery tasks) defies imagination; (d) the early competence literature used in the paper to criticize Piaget actually supports his theory that cognition is developmentally prior to language; (e) Chapman was able to integrate the operative and communicative components of interaction within a Piagetian perspective (Carpendale, McBride & Chapman, 1996); and (f) Siegal's claim that what develops in children's cognition is an interplay of *both* conversational and cognitive is stated but not documented nor elaborated.

Having criticized Piaget for underestimating young children's logical abilities and endowing them with substantial conversational wizardry, Siegal and the authors he cites in his support (e.g. McGarrigle & Donaldson, 1975) have not realized that they may be underestimating young children's conversational abilities and endowing them with substantial cognitive wizardry. For example, as Light, Buckingham and Robbins (1979) remarked, if 'failures in the standard condition [i.e. two-questions condition] are seen as "false negative", non-conservation arising from the implicit message: *this transformation is important*, contained in the tester's action', then should we not regard 'successes in the [one-question] condition as "false positives", conservation arising from the implicit message: *this transformation is irrelevant*, contained in the tester's action?' (pp. 309–310). Siegal's conclusions are based on the tacit assumption that because the one-question condition generates a higher proportion of conservation judgments it must be a more sensitive index of the child's competence. Unfortunately, he does not tell us why that should be the case.

In summary, Siegal embraces what we call the conventional or standard interpretation of Piaget's theory, an interpretation that, among other things, fails to recognize the differences between age of acquisition and sequence of transformation, and between true knowledge and necessary knowledge. Having relied excessively on tabular asterisks at the expense of theoretical risks, Siegal has also failed to recognize that very often in psychology 'problem and method pass one another by' (Wittgenstein, 1958, p. 232). We certainly agree that Piaget's theory must be transformed to fit a wider framework in which there is room for findings it did not predict. But we should also remember that if Einstein was able to improve upon Newton it was only because he knew Newton's theory all too well.

References

Carpendale, J., McBride, B., & Chapman, M. (1996). Language and operations in children's class inclusion reasoning: the operational semantic theory of reasoning. *Developmental Review*, **16**, 391–415.

Light, P., Buckingham, N., & Robbins, A. (1979). The conservation task as an interactional setting. *British Journal of Educational Psychology*, **49**, 304–310.

Lourenço, O., & Machado, A. (1996). In defense of Piaget's theory: a reply to 10 common criticisms. *Psychological Review*, **103**, 143–164.

McGarrigle, J., & Donaldson, M. (1975). Conservation accidents. *Cognition*, **3**, 341–350.

Siegal, M. (1997). *Knowing children* (2nd edn). Hove, UK: Psychology Press.
Siegal, M., Waters, L., & Dinwiddy, L. (1988). Misleading children: causal attributions for inconsistency under repeated questioning. *Journal of Experimental Child Psychology*, **45**, 438–456.
Wittgenstein, L. (1958). *Philosophical investigations*. Englewood Cliffs, NJ: Prentice-Hall.

Necessary knowledge in number conservation

Leslie Smith

Lancaster University, UK

Michael Siegal's paper made me think that I should ask him three questions:

- *Is necessary knowledge required in Piaget's account of conservation?*
- *Is truth conflated with necessity in Siegal's argument?*
- *Is justification required for modal judgment?*

My answer to each question is 'Yes' in contrast to his 'No'.

Is necessary knowledge required in Piaget's account of conservation?

Piaget told us what his central problem is:

> The emergence of logical necessity constitutes the central problem in the psychogenesis of logical structures. (Piaget, 1967, p. 391)

His central problem is to explain the development of necessary knowledge. If you deny this, how do you explain its re-statement over 60 years by Piaget (1928, p. 234; 1950, p. 23; 1986, p. 235; 1995, pp. 51–3; Piaget & Garcia, 1989, p. 15); or in others' commentary (Murray, 1981; Campbell & Bickhard, 1986; Kitchener, 1986; Chapman, 1988; Moshman, 1990; Beilin, 1992; Bickhard & Terveen, 1995; Lourenço & Machado, 1996); or in mine (Smith, 1993, p. 1; 1996a, p. 503; 1997a, p. 224; 1997b)?

Piaget's central problem requires two steps. One step has already been made in modal logic (Sainsbury, 1991; Marcus, 1993). Necessary knowledge is modal knowledge which has a standard definition:

(1) $\Box p = \neg \Diamond \neg p$
(read: p is necessary just in case not-p is not possible)

A proposition is necessary just in case its negation is impossible (Smith, 1997a). A consequence of (1) is that

(2) $p \Rightarrow \Box p$
(read: p entails p is necessary)

is false. Relation (2) expresses a modal fallacy since not all truths are necessities. The second step has yet to be made in psychology. The world is devoid of logical necessity (Wittgenstein, 1961, section 6.37). Experience is the source of empirical truth. But a necessary truth (which could not be otherwise) and an empirical truth (which always could be otherwise) are fundamentally different. Even so, a necessary truth can *in principle* be learned during experience (Leibniz, 1981). What these philosophers omitted to include was an account of how such learning *in fact* occurs. Piaget's insight was to realize that this spectacular omission could be remedied (Smith, 1993, pp. 7, 36).

Two categories of necessary knowledge fit number conservation. All mathematical truths are necessities and all valid deductions are necessities (Smith, 1997a). Number conservation is important because it is a paradigm example of Piaget's central problem of *the construction of necessary knowledge from empirical learning* (Smith, 1993, pp. 1, 90). This problem cries out for explanation, whereas in Siegal's argument it is instead explained away.

Address for correspondence: Department of Educational Research, Lancaster University, Lancaster LA1 4YL, UK; e-mail: L.Smith@lancaster.ac.uk

Is truth conflated with necessity in Siegal's argument?

Piaget's (1952) account is incomplete and it has been elaborated later. First, not all true knowledge is necessary knowledge (Murray, 1981; Campbell & Bickhard, 1986; Moshman, 1990; Smith, 1993, 1997a). Second, preschoolers can use modal language (Byrnes & Duff, 1989; Scholnick & Wing, 1995). This secures 'islands of necessity' in their understanding (Piaget & Garcia, 1991). Third, children give modal justifications as the grounds of their incorrect judgments. Phi was asked the colour of the back of a box whose five visible sides were white. He argued that the rear side is white because '*the back can't be another colour*' (Piaget, 1987a, p. 31). Such answers are pseudo-necessities. Fourth, children can marshal sound modal arguments. In a hidden patterns task, Fra had removed several covers and deduced that it is pattern '*G – it can't be any of the others*' (Piaget, 1987b, p. 114; Ricco, 1997). Modal knowledge is not a late outcome of adolescence, but is instead developing during childhood.

In Siegal's evidence based on his 'four cases', only two types of response are on offer (correct–incorrect). But three into two won't go! Siegal merges Piaget's trichotomy in his dichotomy, merges truth with necessity. This creates a dilemma. At worst, his evidence amounts to a 'false positive' based on the modal fallacy of regarding *true* knowledge as *necessary* knowledge. At best, his argument is indeterminate: we cannot tell whether the children had necessary, as opposed to true, knowledge.

It will be objected: a dichotomy suffices since necessary knowledge develops during infancy (cf. p. 5). But this is to no avail on two counts. First, infants' activities are devoid of truth-value. Their activities confer 'success or practical adaptation, whereas the function of verbal or conceptual thought is to know and state truths' (Piaget, 1954, p. 360; cf. 1953, p. 240; cf. Smith, 1998a). *A fortiori*, practical intelligence is devoid of judgments about necessary truths. Second, research tasks dealing with 'impossibility' conflate the unexpected with the impossible. In Baillargeon's (1995) work, something unexpected really does happen; but something happens and so the event is quite literally not impossible!

Is justification required for modal judgment?

In Siegal's account, justified necessary knowledge 'goes beyond (children's) normal facility' (p. 5) since they are 'conversational neophytes, not wizards' (p. 6). Conversational pragmatics are important. I quite agree. In my view, this makes intellectual development *more difficult for children* in factoring out principles of conservation from the pragmatics of conversation. How can Siegal be so sure that children have 'good logical knowledge' in the face of such a manifest source of sociocentrism (Piaget, 1995)?

Implicatures are not implications

Implicatures are invoked in Siegal's argument in that an interviewer's request for a justification (ideally based on implication) is taken by an interviewee to mean that the previous judgment was incorrect and so should be switched (p. 3). Agreed: this *may* happen (cf. the repetition of *may* on pages 3, 4, 7, 8 and 9). Yet there are two possibilities here. One is that an implicature overrides an implication antecedently available to the interviewee. The other is that an implicature prevents detection of an implication by the interviewee. But which is it? Which judgments – at which of Piaget's three levels – are switched? It is a plain fact that not all children switch judgments (see *inter alia* the protocols of Bon and Hoc in Piaget, 1952, pp. 43–44). Grice (1989) offered no answers here since he offered no account of the *joint* development of implicatures and implications (Smith, 1998b). Experimental studies show that children are cognisant of Gricean maxims (Surian, Baron-Cohen & van der Lely, 1996). But they ignore a logical control and they are silent about implicatures.

Justification is an intrinsic link between judgments

Within any system of knowledge, justifications are the link between different judgments in the system. Progress does not arise *ex nihilo*, from nothing at all (Inhelder & Piaget, 1964, p. 285). Developmental sequences do not run from absence to presence (Smith, 1993, p. 170). They are not 'immaculate transitions' (Kuhn, 1997). Justifications are an internal link in the development of better successors in virtue of mediation intrinsic to the system of knowledge (Piéraut-Le Bonniec, 1990). Judgments are not islands, detached from continental bodies of knowledge. Nor are links between judgments entirely due to education since social mechanisms of transmission do not guarantee knowledge (Smith, 1996b; Smith, Dockrell & Tomlinson, 1997, pp. 6–11; Smith, 1998d). Judgments are intrinsically linked by justifications with other judgments within the mind. These links develop over time. The question of which links are made between which judgments is an empirical question. It is also fundamental (Chapman, 1988). This is denied in Siegal's

argument in which justifications are regarded as eliminable elements in young children's development.

Justification individuates judgment

In diagnostic assessment, a standardized question is such that one-and-the-same question is put to each child in the study. But this requirement is ambiguous (Piaget, 1929). It is one thing to ensure that the same question is asked by the interviewer. But this does not ensure that the self-same question is posed within the mind of the interviewee. Still less does it ensure how the question which the interviewee actually poses is answered. Higher forms of thinking require language (Frege, 1979; Searle, 1995; Carruthers, 1996). Inhelder and Piaget (1964) accepted this view. In consequence, judgments due to higher forms of thinking are not merely correct or incorrect since they may be incomplete or ambiguous. Justifications provide clarifications as to how a judgment is interpreted – by the person whose judgment it is. Such clarification is not merely an aid to the interviewer but is also the sole way that anyone – including the individual whose judgment it is – may know *which* judgment it is. A contrary view is implied by Siegal's argument.

Justification is in principle required for modal judgments

There are two ways to decide what is, and what is not, a case of knowledge. One is through intuition, the other through conceptual analysis. Siegal is reliant on his, and other psychologists', *intuitions* as to what counts as knowledge. But intuitions can be misleading. Fortunately, intuitions can be validated in an *analysis* of the concept of knowledge. There are two dominant analyses (Smith, 1993, section 13). My argument does *not* arbitrate between them. Rather, it applies both to the assessment of modal knowledge. Both analyses lead to the same conclusion, namely that justifications are indispensable. Siegal ignores this argument.

Modal judgments are intrinsically relational

There are two types of modal judgment each of which is defined through a relation. The relation is either equality or entailment. Modally speaking, justifications are the sole way to ascertain the match between 'our' logic and 'their' knowledge of either relation.

Mathematical necessity: equality

Equality is the central relation in arithmetic. 'If you drop equality from arithmetic, there's almost nothing left' (Frege, 1979, p. 165). Further, arithmetical equality is identity (Frege, 1979, p. 120). And identity is a logically necessary relation (Sainsbury, 1991):

(3) $\Box (x = x)$
(read: necessarily, x is x)

In (3), the necessity operator ($\Box$) is modal. The implication is not that all arithmetical learning is modal. Arithmetical learning is principled (Gelman, Meck & Merkin, 1986). It is often inferentially correct (Nunes & Bryant, 1996). Developing a *correct* understanding (e.g. *six is six*) is a major advance. Quite different is a modal advance in line with (3) in acknowledging that *six is, and has to be, six* (Smith, 1993, pp. 63, 90; 1996a, p. 498).

Deductive necessity: entailment

Entailment is the central relation in all valid arguments (von Wright, 1957; Haack, 1978). Entailment is a logically necessary relation (Marcus, 1993):

(4) $P \Rightarrow Q$
(read: P entails Q)

In a valid argument, neither the premises nor the conclusion may be necessary (see the example in Smith, 1993, p. 22). Thus it is not necessary that there are six bottles (class A) and six glasses (class B) in one–one correspondence on Mul's table (Piaget, 1952, p. 45). But if there are, the number must be the same:

(5) $(A \leftrightarrow B) \Rightarrow (A = B)$
(read: A if and only if B entails A is B)

In (5), the relation *if and only if* ($\leftrightarrow$) is truth-functional and so non-modal, unlike the relation *entails* ($\Rightarrow$) which is modal (Sainsbury, 1991; Marcus, 1993; Smith, 1998c). The implication is not that all logical reasoning during childhood is modal. It is an achievement to make *correctly* a logical inference in fantasy or magic contexts (Johnson & Harris, 1994; Markovits, 1995). It is an advance to realize that, in a specific array, six is the number of objects in one line matched with six in the other, *so the number is actually the same*. But correctness is not necessity and so, in this context, a modal realization that *the number could not be otherwise* is a different advance (Smith, 1993, p. 67; 1997a, p. 224).

The implication for developmental psychology is pretty clear. True knowledge (e.g. correctly knowing that $7 + 5 = 12$) is not the same as necessary knowledge (i.e. knowing that $7 + 5 = 12$ could not be otherwise). Children access modal principles such as (3) and (4)

neither explicitly nor directly. Their understanding develops over time. This is Piaget's 'central problem' which Piaget did not resolve. In Siegal's argument, this problem is not even addressed.

References

Baillargeon, R. (1995). A model of physical reasoning in infancy. In C. Rovee-Collier & L. Lipsitt (Eds), *Advances in infancy research*, Vol. **9**. Norwood, NJ: Ablex.

Beilin, H. (1992). Piaget's new theory. In H. Beilin & P. Pufall (Eds), *Piaget's theory: prospects and possibilities*. Hillsdale, NJ: Erlbaum.

Bickhard, M., & Terveen, L. (1995). *Foundational issues in artificial intelligence and cognitive science*. Amsterdam: North-Holland.

Byrnes, J., & Duff, M. (1989). Young children's comprehension of modal expressions. *Cognitive Development*, **4**, 369–387.

Campbell, R., & Bickhard, M. (1986). *Knowing levels*. Basel: Karger.

Carruthers, P. (1996). *Language, thought and consciousness*. Cambridge: Cambridge University Press.

Chapman, M. (1988). *Constructive evolution*. Cambridge: Cambridge University Press.

Frege, G. (1979). *Posthumous papers*. Oxford: Blackwell.

Gelman, R., Meck, E., & Merkin, S. (1986). Young children's numerical competence. *Cognitive Development*, **1**, 1–29.

Grice, P. (1989). *Studies in the way of words*. Cambridge, MA: Harvard University Press.

Haack, S. (1978). *Philosophy of logics*. Cambridge: Cambridge University Press.

Inhelder, B., & Piaget, J. (1964). *The early growth of logic in the child*. London: Routledge & Kegan Paul.

Johnson, C., & Harris, P. (1994). Magic: special but not excluded. *British Journal of Developmental Psychology*, **12**, 35–51.

Kitchener, R.F. (1986). *Piaget's theory of knowledge*. New Haven, CT: Yale University Press.

Kuhn, D. (1997). The view from giants' shoulders. In L. Smith, J. Dockrell & P. Tomlinson (Eds), *Piaget, Vygotsky and beyond*. London: Routledge.

Leibniz, G. (1981). *New essays on human understanding*. Cambridge: Cambridge University Press.

Lourenço, O., & Machado, A. (1996). In defense of Piaget's theory: a reply to 10 common criticisms. *Psychological Review*, **103**, 143–164.

Marcus, R.B. (1993). *Modalities: philosophical essays*. New York: Oxford University Press.

Markovits, H. (1995). Conditional reasoning with false premises: fantasy and information retrieval. *British Journal of Developmental Psychology*, **13**, 1–11.

Moshman, D. (1990). The development of metalogical understanding. In W. Overton (Ed.), *Reasoning, necessity and logic*. Hillsdale, NJ: Erlbaum.

Murray, F. (1981). The conservation paradigm: conservation of conservation research. In I. Sigel, D. Brodzinsky & R. Golinkoff (Eds), *New directions to Piagetian theory and practice*. Hillsdale, NJ: Erlbaum.

Nunes, T., & Bryant, P. (1996). *Children doing mathematics*. Oxford: Blackwell.

Piaget, J. (1928). *Judgment and reasoning in the child*. London: Routledge & Kegan Paul.

Piaget, J. (1929). *The child's conception of the world*. London: Routledge & Kegan Paul.

Piaget, J. (1950). *Introduction à l'épistémologie génétique*, Vol. 1: *La pensée mathématique*. Paris: Presses Universitaires de France.

Piaget, J. (1952). *The child's conception of number*. London: Routledge & Kegan Paul.

Piaget, J. (1953). *The origins of intelligence in the child*. London: Routledge & Kegan Paul.

Piaget, J. (1954). *The construction of reality in the child*. London: Routledge & Kegan Paul.

Piaget, J. (1967). Epistémologie de la logique. In J. Piaget (Ed.), *Logique et connaissance scientifique*. Paris: Gallimard.

Piaget, J. (1986). Essay on necessity. *Human Development*, **29**, 301–314.

Piaget, J. (1987a). *Possibility and necessity*, Vol. 1. Minneapolis, MN: University of Minnesota Press.

Piaget, J. (1987b). *Possibility and necessity*, Vol. 2. Minneapolis, MN: University of Minnesota Press.

Piaget, J. (1995). *Sociological studies*. London: Routledge.

Piaget, J., & Garcia, R. (1989). *Psychogenesis and the history of science*. New York: Columbia University Press.

Piaget, J., & Garcia, R. (1991). *Toward a logic of meanings*. Hillsdale, NJ: Erlbaum.

Piéraut-Le Bonniec, G. (1990). The logic of meaning and meaningful implication. In W. Overton (Ed.), *Reasoning, necessity and logic*. Hillsdale, NJ: Erlbaum.

Ricco, R. (1997). The development of proof construction in middle childhood. *Journal of Experimental Child Psychology*, **66**, 279–310.

Sainsbury, M. (1991). *Logical forms*. Oxford: Blackwell.

Scholnick, E., & Wing, C. (1995). Logic in conversation: comparative studies of deduction in children and adults. *Cognitive Development*, **10**, 319–345.

Searle, J. (1995). *The foundation of social reality*. New York: Free Press.

Smith, L. (1993). *Necessary knowledge: Piagetian perspectives on constructivism*. Hove, UK: Erlbaum Associates.

Smith, L. (1996a). Piaget's epistemology. In L. Smith (Ed.), *Critical readings on Piaget*. London: Routledge.

Smith, L. (1996b). With knowledge in mind. *Human Development*, **39**, 257–263.

Smith, L. (1997a). Necessary knowledge and its assessment in intellectual development. In L. Smith, J. Dockrell & P. Tomlinson (Eds), *Piaget, Vygotsky and beyond*. London: Routledge.

Smith, L. (1997b). Jean Piaget. In N. Sheehy, A. Chapman & W. Conroy (Eds), *Biographical dictionary of psychology*. London: Routledge.

Smith, L. (1998a). On the development of mental representation. *Developmental Review*, **18**, 202–227.
Smith, L. (1998b) Review of *Knowing children: experiments in conversation and cognition*. *Developmental Psychology Newsletter*, **16**, 115–124.
Smith, L. (1998c). Modal knowledge and maps of the mind. *New Ideas in Psychology*, in press.
Smith, L. (1998d). What Piaget learned from Frege. *Developmental Review*, in press.
Smith, L., Dockrell, J., & Tomlinson, P. (1997). Introduction. In L. Smith, J. Dockrell & P. Tomlinson (Eds), *Piaget, Vygotsky and beyond*. London: Routledge.
Surian, L., Baron-Cohen, S., & van der Lely, H. (1996). Are children with autism deaf to Gricean maxims? *Cognitive Neuropsychiatry*, **1**, 55–71.
Wittgenstein, L. (1961). *Tractatus logico-philosophicus* (2nd edn). London: Routledge & Kegan Paul.
von Wright, G.H. (1957). *Logical studies*. London: Routledge & Kegan Paul.

Beyond the Gricean maxims: conversational awareness as a multifaceted domain of knowledge

Kang Lee and Michelle Eskritt

Queen's University, Canada

In this thought provoking article, Siegal advances two major arguments: (1) children's conversational awareness is a domain of knowledge in and of itself, and hence an integral part of cognitive development; (2) children's conversational awareness involves knowledge about the conventions of communication. We concur with Siegal's first argument but would like to expand on his second one. We believe that conversational awareness is not just the understanding of the Gricean maxims of communication; rather, it is a multifaceted domain of knowledge that encompasses a set of interrelated knowledge components. Here, we would like to focus on questions and questioning to illustrate our point.

Questions are speech acts that serve critical functions in conversation (Goody, 1978). Questioning calls for the use of knowledge at multiple levels. First, one must have knowledge about *the semantics and syntax* of questioning in order to process information explicitly expressed in questions. Second, one must also process information implicitly expressed. *Implicit information* in questioning is mainly concerned with why the questioner asks a specific question, what the questioner assumes that the questionee already knows, and what the questioner expects in the questionee's reply. This type of information can be inferred from the question itself or the context in which the question is asked, and is therefore often deemed unnecessary to make explicit. For example, when the questioner asks 'Where did he hit you?' the question implies that the questioner knows that the questionee was hit by a person, the hitter was male, the questionee should know whom the questioner is referring to.

Third, one must also have knowledge about the *conventions of communication*, or conversational rules shared by a cultural group. These rules determine when and how certain speech acts should or should not be performed. According to Sweetser (1987), two types of conversational conventions exist to serve different purposes. One is the politeness rule (e.g. 'be amicable', 'do not impose', 'give options' (Lakoff, 1973), the purpose of which is to facilitate interpersonal relations. The other type serves to make information exchange successful. For this purpose, compliance with the Gricean maxims is usually required. In the target article, Siegal convincingly demonstrates how critical these conventions are to the success of questioning for research purposes. It should be noted that most of Siegal's analyses are also applicable in everyday conversations between children and adults.

The fourth, and perhaps the most important, component of conversational knowledge is the knowledge about the *context* in which questions are asked, because we believe it is the context that determines the meaning and function of a question. There are a number of contexts in which questions are used. One is an information-seeking context where the questioner asks

Address for correspondence: Kang Lee, Department of Psychology, Queen's University, Kingston, Ontario, Canada K7L 3N6.

questions to which they are unsure of the answer for the purpose of obtaining new information from the questionee. Another is a knowledge-assessment context in which the questioner, knowing the answer, asks questions to discover what the questionee actually knows. The third is a command-function context in which the questioner asks a question to give rise to the questionee carrying out an action (e.g. 'Can you close the door?'). The fourth is a rhetorical context in which a question serves as a commentary (e.g. 'What kind of person are you?'). Finally, the social grace context is one in which the question and answer are routinized (e.g. 'how are you?').

To answer questions appropriately, it is imperative for the questionee to understand the context in which questions are asked. For example, the information-seeking context calls for the questionee to supply information unknown to the questioner, while the command-function context requires the questionee to carry out an action instead of providing information. The same question may have different meanings and functions depending on the context in which the question is asked. For example, in the command-function context, 'Can you lift this box?' suggests a request for action, but in the information-seeking context it may indicate the questioner's curiosity about the questionee's physical strength.

Siegal is correct that adults must consider children's knowledge about conversational conventions when posing questions to them such that potential conversational clashes can be avoided. We would like to add that conversational clashes occur at all levels of conversational knowledge, not just conversational conventions. At the level of semantics and syntax, misunderstanding occurs when children and adults have different meanings for the words used in questions. For example, for the question 'Did he touch you?', children may have different meanings for the word 'touch' and hence fail to give a correct answer. Misunderstanding can also occur when the implicit information contained in questions is not shared by the questioner and the questionee. Using the same example, the question implies that inappropriate touch has taken place and the answer may therefore be misleading. Finally, failing to distinguish the contexts of questioning may lead to inappropriate responses (e.g. mistaking the information-seeking question 'how are you today' as a greeting).

It should be noted that empirical research on children's conversational knowledge has been very limited. Early research on this issue focused almost exclusively on children's acquisition of the syntax of various forms of questions. Only recently has the development of pragmatic aspects of conversational knowledge been examined. However, very little is known about children's ability to process implicit information contained in questions, their knowledge about the Gricean maxims, and their understanding of the distinctions between different conversational contexts. Admittedly, our analyses of the components of conversational knowledge are rather speculative. Nevertheless, these speculations, we hope, should form the basis for future empirical research on the development of conversational knowledge, a domain of cognitive development that deserves far more attention than it currently receives.

References

Goody, E. (1978). *Questions and politeness: Strategies in social interaction*. Cambridge: Cambridge University Press.

Lakoff, R. (1973). The logic of politeness: or minding your P's and Q's. In *Papers from the Ninth Regional Meeting of the Chicago Linguistics Society* (pp. 292–305). Chicago, IL: Chicago Linguistic Society.

Sweetser, E.E. (1987). The definition of lie: an examination of the folk models underlying a semantic prototype. In D. Holland (Ed.), *Cultural models in language and thought* (pp. 43–66). New York: Cambridge University Press.