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The purpose of this volume is to open new perspectives in the study of narrative development in a multilingual context by bringing together research findings from psychology, linguistics, and education. The editors would like to thank the Dutch Science Foundation (NOW) and the Faculty of Social Sciences of the University of Nijmegen for their support of the initiative for this volume. The editors also wish to thank all contributors to this volume for their cooperation and Karin van der Weijden-van der Laan for her editorial support of this volume.

Ludo Verhoeven
Sven Strömqvist

CHAPTER 14

Logic and mind in Spanish–English children’s narratives

Barbara Zurer Pearson

In the course of a story told in response to Mayer’s wordless picturebook, *Frog, Where are you?* (1969), children have the opportunity to display their awareness of the story characters’ thinking and to demonstrate the linguistic means they have available for expressing that awareness. Such stories permit us to explore relationships between children’s theories of other minds, the language that encodes ideas about ideas, and the conditions which prompt its use. By looking at stories from bilingual children with different levels of language proficiency in two languages but presumably a single cognitive level per individual, we can explore the nature of the relationship between particular cognitive achievements and their linguistic expression. Such an investigation sheds light on developmental changes in the use of and reference to logic and other forms of thought in children’s naturalistic speech and suggests areas for follow-up through experimentation.

The direction of the relation between cognitive and linguistic development is an ongoing debate. Does cognitive growth drive linguistic growth, as a Piagetian model would suggest? Or does language play a more enabling role in the development of children’s reasoning? A specific mechanism by which language could lead cognition has been suggested in recent research on what is called the “Theory of Mind” by J. de Villiers and her colleagues (de Villiers and Pyers 1997a; Gale, de Villiers, de Villiers, and Pyers 1996). These authors propose that sentences with full noun-clause complements for mental predicates (to know, think, pretend, etc. (that something is so)) not only communicate *about* the contents of other minds. They claim further that the syntax of such sentences provides the mental machinery necessary to hold the two ideas in mind simultaneously, having separate referents and a separate truth value for each.

The ability to have two separate linguistic representations for the same

event (described by Nelson 1996) appears crucial for success in formal propositional reasoning. The first manifestation of this skill may be the ability to reason about the false beliefs of others, generally observed to develop between ages 3 and 5 (Wimmer and Perner 1983; de Villiers and Pyers 1997a). It is also important in coordinating information from different sources about a single situation. Such reasoning requires the individual to differentiate and coordinate what Sokol, Muller, and Overton (1997) call "propositional" and "meta-propositional" levels. That is, children must comprehend and encode in their sentences both the facts of a scene and relevant modal information about it; for example, how credible the events represented are. These notions can be expressed lexically, in separate words, but they are most generally "folded into" the choice of grammatical form and expressed through the linking of multiple clauses.

It is well known that children begin using sentences composed of more than a single clause well before age 5 (Bowerman 1979), but the complexity of the multi-clause units expands with exposure to literate academic texts once children are being schooled (Scott 1988). In particular, the meanings of sentence connectives continue to develop through the teen years (Nippold 1988); relationships between clauses become more elaborate and dependencies across clause boundaries are more frequent (Hunt 1977). The choice of subjunctive mood in Spanish, for example, is most often a function of the verb in a previous clause, or as described by Perez-Leroux (1996) for relative clauses, of different presuppositions about the existence of the entities referred to. Also, as children become more conversant with factivity, they become more aware of how the truth value of embedded clauses can change depending on the verb in the adjoining clause. So, an assertion like "John failed the test" will be necessarily true if it comes after "we know," necessarily false if embedded with "we pretended," and indeterminate (but not likely) with "we thought."

More than in dyadic conversation, stories children hear and produce provide a context for linking propositions with logical ties and cohesive devices. As children get older they are more likely to report on others' evaluations of events and to explain actions with reference to the intentions and acts of "other minds" using metacognitive statements, talking about what someone else said or thought, (Kemper 1984). In the case of the Mayer frog story, it is the *lack* of logical thinking on the characters' part that may prompt children to comment on such thinking.

The role of logic and theory of mind reasoning in the Frog story

When the boy and his dog lose their pet frog in *Frog, Where are you?*, they do the logical thing: they look first where the pet had been kept, in its bowl and all around their room for it. When they do not find it there, though, they do not stop and think logically. They could say to themselves:

"Frogs like to be near water.

Our frog is a typical frog.

Therefore, we should look for our frog near some water."

Translating this little syllogism into a plan of action, they might have asked themselves: (1) Where is a froggy body of water? and (2) How do we get there?

Instead, they let a combination of chance and childish curiosity draw them in small steps away from their house and closer to water. They don't actually *decide* to go outside: the dog falls out and the boy goes out after it. Then they go into the woods, conveniently located right outside their window. But once there, they look first in places a frog is unlikely to go, up in a beehive or an owl's nest, for example. Thankfully, though, the bees and the owl chase the pair further into the woods where the boy manages to fall onto a deer who throws him unceremoniously into a small body of water. He is soon joined there by the dog, who once again falls where he would have gone had he thought about it. Here they find a frog, possibly their original pet, and the story resolves with a happy ending (for the boy, not necessarily for the frog).

So the story ends up following a reason-able course, but without any apparent planning from the protagonists. It is not a cognitively taxing story: the action depends on motivation and reaction, with little explicit reasoning. The boy's lack of reflection — and of course the dog's — provide for much of the plot complication. Indeed, if there were more logical thinking involved, there would be less story to tell. As children get older, we may expect them to notice the boy's lack of logic and make increasing reference to thinking and inference even though such references are purely optional in the recounting of the story. That is, as the distance grows between the characters' mental acts and the (child) narrator's own awareness, it becomes more likely that the characters' state of knowledge will appear newsworthy to the narrator, provided she or he has the linguistic means to express it. So, *Frog, Where are you?* is almost entirely an action story, but there is room and rationale for reference to cognition in it.

At least three points in the story specifically invite reference to the characters' state of awareness. First, in panel 2, the boy and dog are conspicuously asleep when the frog climbs out, so when they awaken, they must have a specific realization of the frog's disappearance before a search for it can begin. Later, in panels 13 to 15, there is a depiction of false belief on the boy's part. Before the boy finds the deer, he has climbed up on a big rock and grabbed onto what appear to be branches. By the time he realizes they are not branches, but antlers, he is already high atop the deer's head and about to be carried off by the animal. Finally, when the boy and dog have landed in the water at the end, the boy is shown with his hand cupped around his ear, a conventionalized representation of "listening." He hears something probably froglike before he can see the frogs, and he must interpret the sound as a cue for the search.

In their corpus of frog stories in five languages, Berman and Slobin (1994) found that about three quarters of the adult stories made specific mention of the first of the realizations above, using a mental verb like "realize," "discover," etc. (pp. 53–4). By contrast, only about half of the adults made explicit reference to the boy's false belief (p. 55). The failure to do so may be a result of the way the story is drawn. On close examination, the antlers are very deliberately drawn to suggest branches, and they are also repeated in exact detail in the next panel where it is clear that they are antlers. The drawings in general, though, are small and rather sketchy, so they discourage strict attention to the small details. Furthermore, explanation of the boy's misperception is not absolutely required for the story to make sense. Some perfectly mature stories use the element of surprise instead: "then up popped a deer" or "along came a deer."

On the other hand, the story provides a clear opportunity for the narrator to remark on the boy's false belief. Ending up on a large animal which could bring the boy to the pond where he needs to go is a central point in the story, and so it is a strong candidate for inclusion. Berman and Slobin (1994, chapter IIA) present evidence that older narrators are more likely to use this scene in their stories than are younger narrators. In their analysis of the deer scene among the 12 English and 12 Hebrew subjects at each age, there is a tendency for more mentions of the false belief among older subjects. For example, only four five-year-olds (of 24) even imply the boy's mistake about the antlers, compared to 13 nine's and 20 adults. For those who explain it explicitly, Berman and Slobin report 2, 3, and 12 respectively at each age. There is a

similar developmental trend for the use of an explicit mental verb in recounting the boy's discovery of the missing frog: from 2/24 at 5 years, to 16/24 at 9 years, and 17/24 for adults (pp. 53–4). Their study, though, is largely qualitative and there is no statistical testing of the suggested trends.

Along with the more advanced cognition required to report the boy's false belief in the story, there is also a call for more complex linguistic structures capable of conveying the more complicated message. In particular, the usual syntax to express this notion would be a full noun-clause complement: "He thought (*that*) *it was a branch*, (but it turned out to be the antlers of a deer)." As explained in de Villiers and Pyers (1997a), full noun-clause complements provide the means by which a false proposition can be embedded under a verb and yet the whole sentence will remain true. Thus, "it was a branch" can be false, but the sentence "He thought it was a branch" is still true. (This is the same for other intensional verbs, like "believing," "supposing," etc. and also verbs of communication like "he said.")

De Villiers and her colleagues note the extremely close coincidence in the time between acquisition of full-clause complements and the ability to pass false belief tasks. What de Villiers calls the "usual orthodoxy of cognitive determinism" would offer the explanation that understanding beliefs and states of mind is a prerequisite for using the linguistic forms correctly (de Villiers and Pyers 1997a, p. 1 in ms). She and her colleagues propose a more radical interpretation of the close correlations, a "strong form of linguistic determinism" whereby the mastery of the "linguistic forms of complementation provides the representational structure for handling false belief reasoning" (p. 1). Through their experiments, they provide plausible support for this stronger position. In particular, in a test of 3 to 5-year-olds, the occurrence of noun-clause complements — and not other complex syntax — in the child's spontaneous speech was the best single predictor of passing false belief tasks ($r^2 = .47$, $p < .01$), while the reverse prediction, i.e. using passing false belief to predict complement syntax yielded an r^2 of only .095, which was non-significant. De Villiers and Pyers claim that this asymmetry supports the conclusion that "a certain level of mastery of complements is a prerequisite for false belief and not vice versa" (p. 8).

In making this claim, though, they make what might be an overstatement: that "[without] the grammar and semantics of an embedded complement, [children] have no system to represent and reason about others' false beliefs" (p. 1). According to such a statement, noun-clause complements are a *neces-*

sary and possibly even a *sufficient* condition for reasoning about false beliefs. Such a claim would be weakened if one routinely found false belief reasoning in stories that do not include noun-clause complements.

The present study

The current study explores the strength of the relationship between false belief reasoning and noun-clause complementation in a story generation context. We focus on two scenes of the frog story where there is specific attention to other minds, the discovery of the frog's escape and the deer episode, as well as other language about thinking throughout the stories. The children are English- or Spanish-learning monolinguals and bilinguals at the elementary school level. They are older than those typically studied in connection with the issue of false belief and noun-clause complementation (de Villiers and Pyers 1997a), but following Berman and Slobin (1994), we are not so much interested in documenting the first emergence of linguistic forms. Rather we seek to observe how specific forms gradually become recruited for developing functions. Children must not only be able to produce the forms at a local sentence level, but also in the more demanding situation of organizing a narrative at the global level (Berman and Slobin, Part IV).

As mentioned above, children can tell the plot of the frog story quite adequately with little or no reference to cognitive states. In previous studies (Pearson 1996), we found that the average second-grade monolingual subjects (ages 7 and 8) did just that: "this happened and then this happened and then this happened." But as their own thinking becomes more mature, and as they become more aware of their own reasoning, children appear more inclined to remark on the thinking they infer on the part of the characters whose exploits they are describing. Following de Villiers *et al.*, we hypothesize that children with greater ability in the specific syntactic domain of the noun-clause complement will be more likely to include references to beliefs and logic in their frog stories. Therefore, we examine the children's use of logic and of noun clauses, and the relation between the two.

Clearly, we will not be claiming that false-belief "mentioning" in the stories is equivalent to false belief "passing" in the sense used by de Villiers (Wimmer and Perner 1983; Perner, Leekam, and Wimmer 1987). Nor will the actual utterances of the children in the stories be considered an exhaustive reflection of what the children could produce in the noun-clause domain, say

under experimental conditions. Nonetheless, it is interesting to explore the children's performance in both areas while under the pressure to produce a narrative, where the story-telling context can provide a unique perspective on emerging skills and their relationships.

Our first goal in this study is to evaluate all expressions of logic and metacognitive knowledge in stories told by children ages 7 and 11 to discover whether there is observable growth in this domain within this age range. We replicate Berman and Slobin's false-belief and mental-verb-use findings with a larger group of children. We relate mentions of logic and false belief to the demographic and linguistic factors in the children's background, especially age, socioeconomic status (SES), and language background.

A second objective is to examine the syntactic devices used by the children to express the contents of the characters' thoughts. We look at how often the full-clause noun phrase is used to embed the false belief within a larger proposition, as suggested by de Villiers and Pyers (1997a 1997b). To test de Villiers' claim that linguistic growth precedes cognitive growth, we make use of the fact that some bilingual children can have different levels of skill in their two languages. That is, we presume that each child brings to the task a single set of general intellectual and conceptual abilities, but because of differing amounts of exposure to the two languages children may exhibit a disparity in the level of expression of noun clauses in the two languages, some stronger in Spanish and others in English. Furthermore, we examine the possibility that the developmental trajectory of the noun-clause is different in English and Spanish, even for monolinguals, and thus may play a different role in supporting expressions of logic. In a study of "that-trace," (a component of noun-clause syntax that governs whether the complementizer will be expressed after a movement operation), a group of Spanish monolingual children were shown in a grammaticality judgment task to have more knowledge of that-trace expression than a matched group of English monolingual children (Gathercole 1997; Gathercole and Montes 1997), presumably because the presence of *that* (or *que* in Spanish) was more consistent in all its uses than *that* in English. We confirm whether this pattern of greater noun-clause use in Spanish than English is present in the stories of monolingual and bilingual children.

Our third goal is to examine the relation between the two domains. We explore the effect of false belief expression on other qualitative aspects of the stories. With separate stories in English and Spanish from the children, we evaluate the contribution of different levels of language ability to how the children chose to recount the meta-cognitive aspects of the story. In particular,

we look for evidence that children are more likely to report the false belief in a language where they demonstrate full noun-clause complements than in one where they do not use full clauses, or in which their clauses are in some way defective. We also evaluate whether the use of the full noun clauses has a different predictive relationship in the two languages, due in part to the different status of the embedded clauses in the syntax of the two languages (Gathercole and Montes 1997) or for the two language groups, monolinguals and bilinguals.

Method

Participants

The primary data are a corpus of 257 frog stories in English and Spanish collected from 79 monolingual and 89 bilingual elementary school children in Miami, Florida. In addition, 43 stories in the CHILDES archive (MacWhinney 1995) from Spanish monolingual children were consulted. The Miami children took part in a larger study of language and literacy development which used standardized and non-standardized tests to assess academic development in both English and Spanish. A quasi-experimental factorial study with two nested factors pro-actively controlled for language of the home, language of instruction at school, and socio-economic status. In the full study, there were 20 to 40 subjects in 8 bilingual cells ($2 \times 2 \times 2$, language of the school, language of the home, and SES) and 2 monolingual cells (SES, high versus low) at each of three grades, kindergarten, second, and fifth (average age 5, 7, and 11 years).

All of the children in the Miami study were born in the United States. Testing took place in ten schools in Miami, equated for teacher preparation, school size, expenditure per pupil, and other demographic variables published annually by the Dade County School Board. Two schools where instruction is given in both English and Spanish approximately equally in what is called "two-way" bilingual education (Christian and Maher 1992) were the basis of the matching. They were matched demographically by four schools serving the same populations, but where instruction follows a more standard pattern with all instruction in English, (except an optional half-hour a day of Spanish for Spanish-speakers). The monolingual English children were in schools matched to have a similar curriculum to the schools with Hispanic children as well as similar teacher characteristics and pupil expenditures. The determination of

socio-economic status was made from parent report of years of education and current occupation following a procedure adapted from the Hollingshead (Eilers *et al.*, 1993).

Frog stories were collected from groups of 9 to 12 each in the 8 bilingual cells and 18 to 22 each in the 2 monolingual cells at second and fifth grade (ages 7 and 11). (All of the stories are archived on the 1997 CHILDES CD and Website (MacWhinney 1997) and are available in print versions from the author.) In all, there are 159 English stories from bilingual children, 159 Spanish stories from the same bilingual children, and 79 stories from monolingual English children.

For the current project, 79 stories from the monolingual English children and 178 stories (89 in English and 89 in Spanish) from the bilinguals were analyzed (plus the 43 monolingual Spanish stories from CHILDES). Language of the school and language of the home were not used as separate variables, but were balanced across high and low SES at the two ages, 7 and 11. The 43 Spanish monolingual children, 22 nine-year-olds and 21 five-year-olds, come from Argentina and Spain (MacWhinney 1995, 1997; Bocaz 1987; Sebastian 1989). The stories from Spain are from children "from middle-class literate backgrounds growing up in urban, industrialized settings," (Berman and Slobin 1994: 28). The Argentines are from a university community. They were all classified for our purposes as high-SES.

Procedures

Data collection

Children told the story according to the standard protocol proposed by Berman and Slobin (1994: 22-3). They looked through the book once in advance and then told the story as they turned the pages of the book a second time. The bilingual children told the story twice — in one language on one day and in the other about one to two weeks later, with language order counterbalanced across subjects and groups. To evaluate the effect of telling the story twice on the measures we were collecting, about one-third of the monolinguals also told the story twice after the same interval of time (Pearson 1996).

The Miami stories were transcribed and checked by two bilingual research assistants. Fifteen percent received two independent listenings for reliability checking. Discrepancies were resolved by consensus. The stories averaged 275 words in length, with a mean number of 45 verbed clauses. The monolingual stories from fifth graders were shorter on average than those of monolingual

second graders (259 versus 324 words) while the bilinguals' stories got slightly longer from second to fifth grade, from an average of 246 to 280 words in English; 230 to 250 in Spanish (Pearson 1997).

In addition, standardized tests in English and Spanish from the Woodcock Language Proficiency Battery (Woodcock 1991; Woodcock and Muñoz 1995) and the Peabody Vocabulary Tests (Dunn and Dunn 1981; Dunn, Padilla, Lugo, and Dunn 1986) were administered to all the Miami subjects.

Data coding

Stories were coded for false-belief mentioning, for use of a mental verb for the discovery of the frog's escape, and for the presence of full-clause noun complements as follows. For false belief mention, we found the following steps:

Score Criterion

- 0 No mention of the boy's mistake (sometimes no mention even of the deer).
- 1 Some children refer to the change, but not clearly. Ex. "He was holding a branch. It was a deer."
- 2 Another set are clearer about the change, but do not mention whether the boy is aware of his mistake. Ex. "He holded the branches that weren't really branches."
- 3 Finally, the most mature level would be to mention both the boy's misapprehension and his realization of it. "Y se aguantó y no eran palos, era(n) un venado, pero él no lo sabía" [He grabbed on and they weren't branches, they were a deer, but he didn't know it] or "He didn't realize he was holding a deer's antler."

Thus, in evaluating the false-belief mention for our database, we made four levels: 0–3, representing the levels above. For the mental verb, the coding was similar:

Score

- 0 No specific mention of the boy's awareness. "The boy gets up and starts looking everywhere for the frog."
- 1 The boy's realization can be inferred from the boy's looking at the bowl, but it is not explicitly stated, as in "The boy looks [at the bowl], and the frog is not there."
- 2 An explicit mention of the boy's discovery, as in "He realized that the frog was gone." (Statements that he was upset, worried, or surprised, that the frog was gone were considered to include the realization of the disappearance even without a specific "thinking" verb.)

A similar hierarchy was established for noun clauses found in the stories. A simple non-clausal noun-phrase object was given zero noun-clause credit. The highest score was given to the prototypical noun clause for mental verbs or verbs of communication, with an intermediate value for formulations that were either ambiguous or in some way ill-formed.

Score

- 0 No clausal complement, as in "He told *the story*," even with extended noun phrases or small clauses, as in "He saw *the bowl without the frog*" or "He saw *his frog gone*."
- 1 Complements with a non-finite verb ("he told the dog *to stop talking*") or with an embedded clausal element that was not a proposition (capable of bearing a truth value), as in "... to see *if the frog was there*" or "... to see *what it was*."
- 2 A finite verb clause embedded under the main verb: "he thought *that the deer's horns were the branches of a tree*"; "he realized *that the frog was gone*."

An intermediate score was also given for direct discourse when it included a finite verb phrase: "He said, 'Where is the frog?'" or in ambiguous cases without a complementizer "He thought maybe the frog is here," or when the noun clause used was ill-formed in some way. Thus "he told him **to don't talk*" was coded with a "1." The same coding principles were used for Spanish.

Score

- 2 The full complement structure, "ven *que no está la rana*" [they see that the frog is not there], or "creyendo *que eran unas ramas*" [thinking that there were some branches]
- 1 Intermediate structures, "ver *si está la rana*" [to see if the frog is there]. Also an intermediate noun-clause form which was not the intensional context: "viendo *qué había abajo*" [seeing WHAT was below], or "diciendo *que porqué habían entrado*" [saying *that why had they entered], or the ambiguous "no sabe el niño *que está aquí*" which could be "... *qué está aquí*" [the boy doesn't know that it is here, or perhaps ... *what* is here].

The Spanish children also gave evidence of some problems with the forms, or perhaps beginning to use a noun phrase and then changing to a full clause. Thus we saw:

"ven al sapo *que él había juntado con una novia*" where one might have expected "ven *que el sapo había juntado* ..." [they see the frog that he had gotten a girlfriend, instead of they see that the frog had gotten a girlfriend];

or “el niño decía *que se callase el perro y que silencio*” [the boy told the dog to be quiet and *that “(be) quiet”]

and

“vieron la botella *que él se fue*” [they saw the bottle *that he was gone].

Stories were also coded through the CLAN programs (MacWhinney 1995) for mean length of utterance (mlu), number of clauses, and a subordination index (number of clauses per sentence). Another set of codings compared stories on ten measures of cohesion, lexicon, and syntax developed for the project (Pearson 1996). These encompassed elements like how well the story events were sequenced, how clearly reference to the characters was maintained, and how elaborate the children's sentence structures were.

Data analysis

1. To evaluate the logical and metacognitive statements in the stories, all instances of explicit logical language were identified. Tokens of modals (“would,” “must,” etc.) and intensional verbs (“think,” “wonder,” “realize,” etc.) were tallied for each age, socio-economic group, and linguality (monolingual versus bilingual). False-belief mentions in the deer scene and use of a mental verb in the discovery scene were also tallied and compared to the Berman and Slobin (1994) findings. Incidence of these three types of cognitive expressions for each subgroup by age, language, socioeconomic status and linguality was tested with chi-square statistics, using the values in Berman and Slobin's Chapter Two for the expected values.

2. The use of full noun-clause complements and intermediate forms was tallied according to the same design, and the groups were compared to each other by chi-square.

3. To evaluate the necessity and sufficiency of noun-clause usage for false-belief mentioning, as suggested by de Villiers, the co-occurrences of noun clauses and false-belief mentions were tracked by language and language group and the correlation between them was computed. Correlations were also computed between false-belief mentions and other syntactic and narrative measures derived from the Miami corpus through CLAN analyses. These correlations were done for the whole Miami group and then for the monolinguals and bilinguals separately.

4. A final analysis evaluated our hypothesis of how strongly the ability to encode cognitive elements in the stories was tied to the child's level of expression generally. Stories with false-belief mentions were compared to those

without false-belief mentions on a host of other qualitative measures. Some of those other measures were taken from the stories and others were the standardized measures of language (expressive and receptive vocabulary, and reading) tested in the parent grant (Eilers 1997; Dunn and Dunn 1981; Dunn *et al.*, 1986; Woodcock 1991; Woodcock-Muñoz 1995). Differences on these measures between the two sets of stories were evaluated for significance by t-test. A similar analysis compared stories that used noun clauses to those without noun clauses and those with intermediate noun-clause forms.

Results

Logic and metacognitive language

The language of logic

As a whole, there was a fair amount of informal reasoning in the stories about causes and motivations based on expectations created by the children, but these were not couched in the typical language of logic. In fact, there was only one prototypical “if-then” statement in the whole corpus, from a monolingual English (MLE) high-SES fifth grader:

“Thank goodness the pond was there. If it wasn't, we would be hurting.”

There was also this statement, which could be translated into a syllogism, from a MLE high-SES second grader:

“They thought maybe the frog's here because there's a stream and frogs live near streams.”

Another child in the same demographic group exhibited a similar sense of logic when he exclaimed:

“[the boy] decides [the swamp] might be the perfect place to look around.”

One low-SES second-grade girl said:

“This is the right place for Berty [the frog] to be. Let's check around.”

And a high-SES bilingual fifth-grader offered this inference:

“thinking that their frog must have had babies.”

In the whole English corpus, there were only 148 tokens of modals, the words most closely associated with inference. The modals used most were “could,”

"can," and "would," as opposed to "may," "must," and "might." There was little difference in their frequency between second and fifth grade or between monolinguals and bilinguals. With respect to intensional verbs ("think," "realize," "wonder," "know," etc.), there was a different pattern among bilinguals and monolinguals. For the monolinguals, there was no age effect ($p > .2$ by χ^2), but there was a decided difference by socio-economic status, with high-SES children using almost three times as many of the 32 instances of these verbs ($p < .01$ by χ^2). Among the bilinguals, there was a significant increase in talk about thinking from second to fifth grade as well as the high-SES effect noted with monolinguals (21 versus 42, 38 versus 25, respectively, both $p < .001$ by χ^2).

False-belief mentioning

False-belief mentioning among the groups is shown in Table 1. The false-belief mentioning among the monolingual high-SES children was consistent with the pattern found in Berman and Slobin, (1994: 55, Table 4). That is, about one half of the 11-year-olds in the high-SES monolingual English groups and the 9-year-olds in the monolingual Spanish group explicitly mentioned the boy's

Table 1. False-belief mentioning by language, language background, age and socio-economic status

Language status	Age	SES	Mentioners	Per cent
MLE	11	High	9/20	45%
		Low	2/22	9 ^a
	7	High	6/19	32
		Low	4/18	22 ^a
MLS	9*	(High)	12/22	54
	5*	(High)	4/21	19 ^a
BLE	11	High	2/20	10 ^a
		Low	3/20	15 ^a
	7	High	5/20	25 ^a
		Low	2/29	7 ^a
BLS	11	High	1/20	5 ^a
		Low	3/20	15 ^a
	7	High	1/20	5 ^a
		Low	0/29	0 ^a
All			55/300	18%

*From A. Bocaz (1987) and Sebastian (1989), both from the CHILDES database (MacWhinney 1997).

Note: superscripts denote percentages significantly different from expected values by χ^2 , $p < .05$, and in most cases $< .01$.

false belief, whereas children in the other demographic groups mentioned the misapprehension significantly less often.

Comparing to the 50 per cent expected value, derived from the Berman and Slobin data, the high-SES monolingual children 7 or older showed an equivalent percentage of "mentioning," but all other groups, the 5-year-olds, the low-SES monolinguals and all the bilinguals, were significantly lower. Bilinguals mentioned the false belief more often in English than Spanish (12 versus 5 times); only half of the time did the same child report it in both languages. In general, stories, whether told first in English or Spanish, were more elaborate in English.

Mental verb results

The use of a mental verb was more common than false-belief mentioning, 45 per cent versus 18 per cent of all stories. There was some growth from second to fifth grade, from 41 per cent to 60 per cent ($p < .05$, by χ^2), but the SES effect, 56 per cent for high-SES versus 46 per cent for low-SES, did not reach significance. The Berman and Slobin findings (1994: 53-4) indicate 8 per cent for 5-year-olds, but 66 per cent for 9-year-olds and adults in a mid-SES sample; thus, these children used a mental verb slightly less often than might be expected.

Noun-clause results

As with false-belief mentioning, not all stories included full-noun-clause complements, reflecting their optionality. The use of full-clause noun complements by the children in the different demographic categories is shown in Table 2.

In English, the percentage of noun-clause use in the monolingual groups was somewhat higher than for false-belief mentioning: 41 per cent noun-clause use versus only 26 per cent mentioning, and the SES-effect was less pronounced. In Spanish, there was more tendency for full finite noun clauses than in English. Seventy percent of the monolingual Spanish children used full noun clauses compared to 41 per cent of the monolingual English-speaking children, ($\chi^2 = 26.2$, $p < .001$). This may be a result of differences in the syntax of the two languages, as suggested by Gathercole and Montes (1995/1997). For example, in the Spanish "say" clause, the only option for reported speech is a full clause with "que" ("le dijo al perro *que se callara*") [he told the dog that

he be quiet], unlike English where the speaker can use an infinitive complement: "he told the dog *to be quiet*." The Spanish children could, of course, still use direct speech, as many did, for example, "Dijo, 'Silencio.'" [He said, "(Be) quiet.""] It is also possible to use infinitive forms in the intensional contexts in Spanish, as in "sin ellos saber" [without their knowing, or literally, without they to know] and "sin darse cuenta" [without taking account]. Unlike in English, these were relatively sophisticated uses and were seen in only two or three stories, all of which also contained other more standard noun-clause locations.

Monolingual English-speaking children showed more use of intermediate forms and more errors in their use than similar aged (or slightly younger) Spanish-learning monolinguals: 29 per cent versus 12 per cent, ($\chi^2=4.5$, $p<.05$). Even the bilingual children did significantly better with Spanish noun clauses than English ones. Their percentage of correct use ($\chi^2=7.11$, $p<.01$) and intermediate or erroneous forms ($\chi^2=9.8$, $p<.01$) in each language mirrored the imbalance in favor of Spanish seen in the two monolingual groups. This is all the more surprising because in most other measures the

Table 2. Noun-clause usage by language, language background, age and socio-economic status

Language status	Age	SES	Noun-clause use	Intermediate forms
MLE	All		41%	29%
	11	High	10/20	8/20
		Low	9/22	5/22
	7	High	9/19	5/19
		Low	4/18	5/18
MLS	All		70%	12%
	9*	(High)	21/22	0/22
	5*		9/21	5/21
BLE	All		40%	37%
	11	High	12/20	6/20
		Low	7/20	9/20
	7	High	10/20	7/20
		Low	7/29	11/29
BLS	All		58%	17%
	11	High	14/20	4/20
		Low	11/20	6/20
	7	High	12/20	3/20
		Low	15/29	2/29

*From A. Bocaz, (1987) and Sebastian (1989), both from the CHILDES database (MacWhinney 1997).

bilingual children's English was generally stronger than their Spanish. The disparity may reflect a difference in the distributions of the forms in the target languages and may also be a clue to their relative difficulty for learners.

The relation between noun-clause complements and false-belief mentioning

Finally, what does our corpus reveal about the relationship between noun-clause complements and false-belief mentioning? Since adults, who may be presumed to have the ability to pass false belief tests, mention the false belief in the stories only half of the time, failure to mention false belief in the story cannot be taken as an indication that the narrator cannot do so. In the age group producing the stories, there is little question that almost all, if not all of the children, in a proper experimental circumstance, would be false belief passers. We make no claim that false-belief "mentioning" in the frog story is equivalent to false belief "passing" in the work of de Villiers and her colleagues (or others). Mentioning may, however, index how salient the concepts are and how relatively accessible they are to the narrator. Similarly, noun-clause use within the story is not claimed as a criterion for knowledge of the noun-clause forms. The use of the forms implies noun-clause knowledge, but failure to use noun clauses may imply a lack of motivation rather than a lack of mastery. So, demonstrations from these two aspects of the corpus will not be interpreted as indicators of what the children CAN do, but just what they DID do in this naturalistic, but constrained task of production.

Our question is how the child's knowledge of these two competencies — one cognitive and one linguistic — is reflected in their actual performance in the semi-spontaneous situation of telling the frog story. Was a specific relationship observed between false-belief mentioning and noun-clause use, as de Villiers claims for the early acquisition?

The most obvious relationship between them comes from the fact that the most typical way to report a false belief is with a sentence that includes a noun-clause complement: "He thought *that they were branches*, but then he learned/found out/ discovered *that they were the horns of a deer*." However, the noun-clause syntax is not obligatory and we observed several instances where the child reports the false belief using less complex syntax. Especially in a story context, the child can use direct speech instead of an embedded clause to convey the change of the boy's awareness:

“He said, ‘Oh, it’s a deer and not a tree.’”

Other examples use coordination rather than embedding:

“Se aguantó y no eran palos, era(n) un venado, pero él no lo sabía” [He grabbed on and they weren’t branches, they were a deer, but he didn’t know it].

Since there are alternative locutions, it is not a necessary relationship between false-belief mentioning and noun-clause complements. Still, it could be the case, as de Villiers suggests, that children would not have “the mental machinery” to handle false belief perceptions and reports until they had mastered noun-clause complements. Our data cannot test that claim directly, but may provide indirect evidence for or against it. In particular, de Villiers’ position would be weakened if one were as likely to find false belief reports in the absence of noun-clause complements as noun-clause complements without false belief reports; it would be strengthened if noun-clause use was more common earlier than false-belief mentioning. In fact, Table 3 shows that the latter situation prevailed: noun-clause use without false-belief mentioning was more frequent than the reverse in both languages.

There was more noun-clause use than mentioning, so we may hypothesize that noun-clause use is prior to — or at least easier to access than — mentioning. Indeed, noun clauses facilitate the expression of the false belief so it may be that the subjects who can express the false belief without the help of noun clauses are in some other way precocious. By the same token, use of full noun clauses does not guarantee good perception of the events. One child, a low-SES monolingual English second-grader said: “[The boy] saw *that they were branches* and then a deer came by.” He or she has a prototypical noun clause, but completely misses the point of the boy’s perception. So, noun-clause use is not a sufficient condition for making the inference, but noun clauses may be a step toward the inference for most children.

The case for a specific link between noun clauses and theory of mind would be strengthened further if noun-clause use, and NOT other syntactic

learning, were shown to be associated with false-belief mentioning. We compared the correlation of noun-clause use with the specific cognitions in the story and also with other scores of story quality to similar correlations done with those same scores and two other more general syntactic measures, a subordination index and a Complex Syntax Score. These other measures included adverbial and adjectival clause tallies as well as noun-clause use. (See Pearson 1997, for a fuller description of the other frog story measures.) All three syntactic measures (noun clauses, subordination index, and Complex Syntax) showed about the same association with the occurrence of the cognitive descriptions in the story: $r=.3$ to $.35$ for either the use of a mental verb in the escape scene or the false belief in the deer scene or about $.45$ with a composite score for either cognition. (These are significant, $p<.05$, but fairly modest.) In the correlations to other measures, noun-clause use correlations were lower and thus appeared more specific to these cognitive elements. By contrast, the other two syntax scores also correlated highly to other measures from the story unrelated to the cognitive elements: Story Sequencing and Lexicon. Thus, this may be a weak indicator in support of greater specificity for the noun-clause measure than for the more general syntactic measures.

The correlations between references to cognitive states and syntax measures were also done separately for the Miami monolingual and bilingual groups. Values for monolinguals alone and for bilinguals in English were similar to those reported above for the whole group. However, for bilinguals in Spanish, the correlation was very low ($r=.08$, n.s. between false-belief mentioning and noun-clause use, $r=.11$, n.s. between false-belief mentioning and the more general subordination index), most likely because there were only five false-belief mentions in the bilinguals’ Spanish corpus, too few to make an adequate test.

For the most part, both false-belief mentioning and noun-clause use were associated with higher levels of language and literacy generally (counting of course measures that do not include either factor as a component). That is, although correlations of false-belief mention or noun-clause use with other language and literacy measures on the children were modest (in the $.2$ to $.4$ range), the children who used noun clauses or mentioned the false belief had higher scores on most of the other measures evaluated than children who did not, indicating that their level of language was higher in general.

When we divided the corpus according to whether the false belief was mentioned or not, we found the results described in Table 4. The first set of measures in the table are derived from different aspects of the frog stories

Table 3. False-belief mentioning and noun clause usage

	English		Spanish	
	Monolingual N=79	Bilingual N=89	Monolingual N=43	Bilingual N=89
False-belief/no noun clause	2	1	1	0
Noun clause/no false belief	19	24	16	48

Table 4. Average scores on other language and literacy measures according to false-belief mention in the Frog Story (monolingual English and bilinguals, English and Spanish)

Measure	False-belief mentioners (N=26)	Non-mentioners (N=135)
<i>Story Measures</i>		
Number of Clauses	54**	44**
Story Sequencing (of 12)	9.0**	7.9**
Referential Adequacy (of 6)	5*	4.5*
Verb Phrase Elaboration (of 12)	10**	8.7**
Story Lexicon (of 15)	9.7**	7.4**
Morphosyntactic Accuracy (of 12)	9.4**	7.9**
Mean Length of Utterance (MLU)	8.2	7.8
<i>Standardized Language Measures</i>		
Peabody Picture Vocabulary (receptive)	99**	89**
Woodcock Picture Vocabulary (expressive)	96*	89*
Woodcock Verbal Analogies	102*	95*
Woodcock Reading Comprehension	102	102

Note: *p*-value from *t*-test <.05 marked with *; *p*<.01 marked with **

(Pearson 1996); the others are standardized test scores collected for the parent grant. Mean scores on almost all measures were higher for children who mentioned the false belief, in most cases significantly so. Likewise, scores on these other measures were higher for the children with full noun clauses than those with intermediate forms or no noun clauses, as shown in Table 5.

Although many qualities beyond logical inferencing ability can contribute to a good frog story, in actual fact, the children who paid close attention to the details of this scene involving the false belief appeared to have consistently higher scores on other aspects of the story as well. It was not just a question of attending to details throughout that made a story good. Many immature stories were painfully detailed picture descriptions, but they failed to provide any interpretation of the story characters and their actions. By contrast, stories that picked out the logical connection between the key pictures involving the deer’s appearance and elaborated on it with embedded sentences were superior in most other aspects as well.

Conclusions and discussion

Overall, the frog stories have provided an opportunity for children to demonstrate their skills in these two related cognitive and linguistic domains. They

do not give the whole picture, but they shed an interesting light on it.

We have seen that the frog story is not a particularly “cognitive” or “logical” story. Indeed, we have examined a large number of stories and found exceedingly few explicit logical references in them. Even for adults, the particular moments in the picture sequence that invite reference to the characters’ thinking do so only in about 75 per cent of the cases; and only about 50 per cent of the time do adults mention the false belief suggested in the story. For the 11-year-olds in our dataset, about 66 per cent of the children used a mental verb in their description of the events, and 50 per cent mentioned the false belief, compared to 41 per cent and less than 30 per cent, respectively, for the 7-year-olds. There is, thus, some growth in the use of mental verbs and false-belief mentioning in the stories during the age range under investigation. High socioeconomic status was seen to contribute to the child’s reference to thinking in the stories, although the SES effect was not observed among bilinguals.

We also observed that noun-clause use rose from 35 per cent at age 7 to 45 per cent at 11 (among the English monolinguals). We can infer that, even though noun clauses are technically “acquired” already, the handling of such

Table 5. Average scores on other language and literacy measures according to level of use of noun clauses (NC) in the Frog Story (monolingual English and bilinguals, English and Spanish)

Measure	NC Zero (N=46)	NC=1 (N=56)	NC=2 (N=66)
<i>Story Measures</i>			
Number of Clauses	42.5 ^a	44.2 ^b	51.3 ^{a,b}
Story Sequencing (of 12)	7.2 ^{a,c}	7.9 ^{a,b}	8.7 ^{b,c}
Referential Adequacy (of 6)	4.2 ^a	4.6	4.8 ^a
Evaluative Language (of 6)	1.9 ^a	2.1 ^b	3.0 ^{a,b}
Verb Phrase Elaboration (of 12)	7.8 ^{a,c}	8.6 ^{a,b}	9.8 ^{b,c}
Story Lexicon (of 15)	6.7 ^{a,b}	8.0 ^a	8.2 ^b
Morphosyntactic Accuracy (of 12)	7.3	8.3	8.6
Mean Length of Utterance (MLU)	7.1 ^{a,c}	7.8 ^{a,b}	8.4 ^{b,c}
<i>Standardized Language Measures</i>			
Peabody Picture Vocabulary (receptive)	87.1 ^a	89.0 ^b	96.6 ^{a,b}
Woodcock Picture Vocabulary (expressive)	85.5 ^a	89.9	94.9 ^a
Woodcock Verbal Analogies	90.1 ^{a,b}	96.9 ^a	100.9 ^b
Woodcock Reading Comprehension	101.0	103.1	104.6

Note: paired superscripts within a row identify values that differ significantly from each other by *t*-test, *p*<.05.

clauses within the story context is undergoing development within this age span. In addition, the presence or absence of noun-clause complements in stories was a powerful indicator of the extent to which the story addressed the characters' cognitions, although there was no specific support for it to be considered a precondition. We interpret the timing of these developments as weak support for de Villiers' position that syntactic growth is leading cognitive growth within this domain. Our findings are, at least, not inconsistent with that claim.

We observed a pronounced cross-linguistic difference in English and Spanish with respect to the use of full-clause noun complements. There is a suggestion in these data that the monolingual Spanish children demonstrated greater facility with noun-clause syntax than the monolingual English children did. This may be due, perhaps, to its greater regularity in Spanish than in English, and this may have encouraged earlier and more frequent references to the characters' cognitions in the stories of the Spanish children. The number of stories available and the imperfect matching of the groups being raised in different countries limit our ability to make firm conclusions in this regard, but this may be a profitable avenue for future research. It will also be informative to probe more deeply the "intermediate" noun-clause forms observed in this study to see both the specifics of their developmental sequencing and their relation to specific cognitive developments such as those in the frog story.

Results for the bilingual children are in the same direction as those for monolinguals. Bilinguals reported the false belief about half as often as the monolinguals did. Children who reported the false belief in one language sometimes reported it in the other as well, although 7 of them reported it in only one language or the other, not in a pattern predicted by whether it was a first or second telling for the child. When we compared noun-clause use in each language, both the frequency and accuracy of the bilinguals' use mirrored the direction of the discrepancy noted between English and Spanish monolinguals. The bilinguals made more errors in noun-clause use in both languages than did monolinguals, but like the monolinguals they used more full noun clauses in Spanish and made more errors in their use in English. There are several possible explanations for why the bilingual children were less likely to produce false belief reports (or mental verb mentions) in either language. It may be that their language facility was somewhat lower in both languages (as was found in standardized testing, Umbel and Cobo-Lewis 1997), and so they might have had fewer linguistic resources available to treat the cognitive aspects of the stories. Or, they may simply have interpreted the task more narrowly as a language task: to demonstrate whether they were able

to talk about the story events in English one day and in Spanish on another day. Further research on this question with bilinguals should use a more specific test of false belief in addition to the frog story.

De Villiers singled out the syntax of noun clauses as particularly predictive of the specific cognitive developments of Theory of Mind reasoning. Indeed, the syntax of noun clauses is "specialized" for articulating the contents of other minds and maintaining the distinction that those facts and opinions can be different from what the speaker knows and thinks. So one can say, "The boy thinks *the antlers are branches*, but *I can see that they are not*" and there is no confusion about who thinks what. Beyond the syntactic structures themselves, there are pragmatic and semantic conventions that help speakers communicate factually and evaluatively about what others think. Children who have learned noun-clause syntax still need to learn the conventions that interact with the syntax in governing, for example, which referents are substitutable (de Villiers, Pyers, and Broderick 1997), or when adverbial modification changes the scope of the predicate (de Villiers, Curran, DeMunn and Philip 1997). Once they can use noun clauses and pass theory of mind tasks, children are in a position to begin learning more subtle aspects of their grammar, but knowledge of other minds in itself is not a *sufficient* condition for the further developments.

Noun-clause syntax may play a similar pivotal, but insufficient, role in children's narrative development. That is, the mastery of noun-clause syntax gives children a more efficient means to talk about the contents of other minds and to perform logical operations on propositions held by others (de Villiers and Pyers 1997b). Such syntax can alert them to notice a distinction between what "he said" and "she knows," and it may even hasten their doing so. But in a story context, there are many other demands. Whether the child notices and describes the characters' cognitive states depends at least in part on how well she can accomplish less specifically cognitive tasks and how much processing capacity she has left over for the cognitive side of the story. Before the child can think and talk clearly about the story characters' thoughts, she must first be able to create the proper context within which those thoughts will make sense to the listener. She must first organize and recount a sequence of events, describe external states, and so forth to accomplish a number of tasks not governed by this particular cognitive advance on her part.

Overall, elaborate stories were not necessarily metacognitive, but all stories with more metacognitive references were more complex than those without them. Of the 211 children, only four mentioned the boy's false belief without

using an embedded noun clause to do so, while over half used noun clauses but did not mention the false belief. Thus, for most children, bilingual and monolingual, it appears that the more complex syntax is prior to — or at least easier to access — than the more complex cognitive messages it can convey.

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CHAPTER 15

From affect to language

Development of evaluation in narratives in spoken English and American Sign Language

Judy Reilly

Whereas the focus of this volume is primarily concerned with bilingual acquisition and narratives, this chapter departs from the canonical form to explore a specific aspect of narratives: the development of evaluation across two different languages conveyed in two different modalities, spoken English and American Sign Language (ASL). In their seminal article in 1967, Labov and Waletzky (1967) first introduced the concept of evaluation in narratives. They suggested that narratives included both referential and evaluative functions. From their perspective, *referential* aspects of narratives include information about the characters and events of the story; it is what moves the story forward, and constitutes the plot. In contrast, the *evaluative* aspect of narratives gives sense or meaning to the story. According to Labov and Waletzky, 'the evaluation of a narrative is defined by us as that part of a narrative which reveals the attitude of the narrator towards the narrative by emphasizing the relative importance of some narrative units as compared to others' (1967:37). In this chapter, we use stories from preschoolers and school-aged children to explore how children express evaluative information and how the nature of evaluation and its expression change over time. Our focus is on the transition from the early utilization of emotional expressions to convey evaluation by preschoolers to its lexicalization in school age children who primarily convey evaluation linguistically. We begin with a brief discussion of our own work, as well as that of colleagues, on the development of evaluation in spoken English narratives. We then consider aspects of the nature and development of the evaluative function in signed narratives.

As noted above, the evaluative elements are those aspects of story telling which convey the significance of certain referential events in the narrative. They give the story meaning by transmitting the personal significance