

# Interpreting Texts and Interpreting Nature The Effects of Literacy on Hermeneutics and Epistemology

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*In this paper it is argued that literacy has its cognitive effects indirectly, through the conceptual distinctions and social practices that it fosters, rather than directly, through the actual activities of reading and writing. The conceptual distinction examined in particular is that between what is given, whether in texts or in nature, and what is inferred or interpreted by the reader or observer. Children's acquisition of this distinction is decisive, it is argued, to the development of a literate mode of thought.*

Harold Innis writing in 1949 (Innis, 1951) and Marshall McLuhan writing only four years later (McLuhan, 1953) brought about a decisive change in our orientation to the study of literacy. Prior to their writing on the "bias" of communication media, literacy was generally considered to be a simple, unadulterated good, a mark of progress and of civilization. True, there were some counter arguments such as those presented by Plato in the *Phaedrus* (cited in Goody and Watt, 1963) to the effect that writing would destroy memory and Rousseau's argument in *The Origin of Language* that writing would dehumanize language by separating the author from his text, but by and large the prevailing assumption was that language is what makes us human and literacy is what makes us civilized.

<sup>a</sup>hermeneutics, the interpretation<sup>c</sup>  
of texts, provided the conceptual  
categories for scientific epistemo-  
<sup>b</sup>logy, the interpretation of nature<sup>d</sup>

The argument presented in this paper is developed more fully in a forthcoming book with the working title *The World on Paper*. This research was supported by grants from the SSHRC, the Spencer Foundation, and a Fellowship from the Center for Advanced Study in the Behavioral Sciences, Stanford, California, for the year 1983-84.

But with the writing of Innis and McLuhan, literacy came to be seen not as the solution to every other problem, but rather as a problem in its own right, indeed the central problem in coming to understand ourselves and the modern world. Complemented by such contemporary and seminal works as Eric Havelock's *Preface to Plato* (1963) and Jack Goody and Ian Watt's *Consequences of Literacy* (1963), literacy came to be seen as a decisive factor in the evolution of modernity — in the development of Protestantism, modern science, law and government, and even consciousness. Decisive in this transformation was the invention of the alphabet and in the invention of printing. And finally, the effects of literacy were more or less invisible to us; what we took to be natural was, in many cases, the consequence of the particular biasing effects of alphabetic literacy.

These writers, while agreeing about the consequences of literacy, differed in their hypotheses as to how these effects were brought about. Havelock thought that the alphabet permitted explicitness of representation such that decoding could be distinguished from understanding (a position very close to the one I shall develop presently), Goody and Watt suggested that writing made language into

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an object of reflection, and McLuhan and Innis argued that writing altered the sense ratios. No one hypothesis has received general, let alone empirical, support.

The hypothesis I shall advance is closely related to that recently advanced by Brian Stock in his remarkable study of literacy in the Middle Ages, *The Implications of Literacy* (1983). In that work Stock documents the increasing use of writing and of written documents for such purposes as law, theology, philosophy and science. In those domains uses of literacy regularly and systematically altered those institutions and the individuals participating in them. To cite a single example. In the early Middle Ages a variety of forms of evidence could be presented at a trial to determine the innocence or guilt of a person charged with a crime. Some of these forms of "evidence" now strike us as decidedly odd. Eye witness testimony was used but so were, he points out, dreams, prophesies, and visions. If someone had a dream that the accused had committed a crime, that was an important form of evidence for his guilt. That changed with literacy. Stock points out that some new conceptual distinctions came to be drawn (or old distinctions came to be honored more systematically) as judges and courts became more literate. Simultaneously, the distinctions made in the administration of law came to be made in other domains such as writing up the lives of the Saints and their miracles. What were these distinctions? Here is the crucial point: a distinction was made between texts and their interpretation and between facts and their interpretations. The former were coming to be seen as objective while the interpretations were coming to be seen as subjective, personal and invented or fabricated.

Here, I believe, we have our link between literacy and modernity — the systematic distinction between something which is taken as given, fixed, autonomous, and objective and something which may be construed as interpretive, inferential, and subjective. My hypothesis is that the contrast between texts and their interpretations provided the model, more than that, the precise cognitive categories or concepts needed for the description and the interpretation of nature; that is, for the building of modern science. To state this somewhat grandly, hermeneutics, the interpretation of texts, provided the conceptual categories needed for scientific epistemology, what I referred to above as the interpretation of nature. Let me spell out the relation and provide some evidence for the hypothesis.

### *The Conceptual Change Hypothesis*

The Reformation, the rise of modern science and mentalistic psychology are, of course, social movements, but they all rested. I argue, on a new conceptual distinction. What is that distinction and how was it

derived from writing and literacy? A written text preserves only part of language. What is preserved is the form, and the meaning has to be regenerated from that form by the reader. The preserved part we'll talk loosely of as being "given", "fixed", "permanent"; the reconstructed part we can call, roughly, the meaning, the intention, the interpretation.

That distinction is implicit in speech, but the relation between a text and an interpretation becomes problematic only in literacy. In oral language the form and meaning form an indissoluble pairing. When we don't understand a sentence/utterance we say, "What do *you* mean?" not "what does *it* mean?", focussing upon the person doing the communicating, not on the utterance. Furthermore, we use much beside the linguistic form to gather a person's intentions with the result that it is virtually impossible to distinguish what was said, the form, and what was meant by it, the meaning. In speech, then, form and meaning are indissolubly linked or at least perceived as such by speakers. Children and non-literates both show little distinction between them as I'll show presently.

Writing preserves what is said, the very words, while the meaning or intention is lost and must be reconstructed from the text, context, and the like. With writing, meaning and interpretation becomes a problem. Writing, I said, invited the distinction between what a text said and what it meant; the first part is taken as "given", the second is taken as the "interpretation". The relation between texts and their interpretation is the problem of hermeneutics. And the development of a sharp distinction between texts and their interpretation gave rise to Luther and the Reformation.

### *Hermeneutics*

Literacy created hermeneutics. The development of a distinction between statements and texts on one hand and their interpretation on the other was a consequence of literacy. Two examples of how the literate distinctions altered orientation to language will help to make this point.

Pre-literate societies — both the pre-literate Greeks and the pre-literate Azande studied by Evans-Pritchard in the thirties — used oracles for giving advice and making predictions. The oracles would utter a prediction and with remarkable frequency these oracles told the truth, or were at least taken as telling the truth. Recall Shakespeare's *Macbeth* in which the oracular witches promised that Macbeth was secure until Birnam Wood came to Dunsinane only to be fulfilled by the attacking soldiers carrying boughs of Birnam wood as camouflage in their attack on Dunsinane. The interesting point about oracles is that they largely disappeared with literacy. Why?

The conceptual hypothesis offered above can take this in stride. In a pre-literate society there is little or no distinction between a text and its interpretation. The preliterate attitude is that the interpretations arrived at by the listener were actually intended by the speaker. There is no recognition of the ambiguity of the pronouncements. Later events, taken as fulfillment of the oracle, were seen as having been intrinsic in the pronouncement. Again, there was no distinction between what the oracle said and its interpretation by the listener. Any interpretation arrived at by the listener was ascribed to the speaker. Oracles fell to literacy because literacy involved an awareness of that distinction. If the interpretation could not be ascribed to the oracles, the oracles lost their power. The horoscope is, of course, a modern-day version of the oracles which, I believe, we still read with a tingle of the possibility of prescience. But serious reading lets one see their enormous "openness" to interpretation; the texts are written to be ambiguous. Writing, by preserving the words but not their meanings, invites the distinction between a text and its interpretation.

A second example comes from the remarkable work on witchcraft and oracles among the Azande, a non-literate or traditional society, in which Evans-Pritchard (1937) commented on a peculiarity of interpretation: He noted anything a suspected witch may say is "interpreted in a different sense from the one the speaker intended to give his words" (p. 133). Evans-Pritchard was surprised that these "interpretations" were attributed directly to the speaker and used to prove his guilt. The same is true of the language of ritual. Leach (1966) points out that "a great variety of alternative meanings [are] implicit in the same set [of categories]" (p. 408). Clearly, these were not interpretations in a literate sense — they were not thought of as having been made up by the hearer as we would think of them. Rather, any interpretation made by the listener was ascribed to the speaker. The Azande interpret language, of course, but they do not distinguish their interpretations from what the speaker actually said. This is just the problem that children in our society have with the ambiguity of language. They assume that the intention or interpretation is exactly what the speaker said. When they arrive at an interpretation, they are convinced that the sentence could not be interpreted any other way (Beal and Flavell, 1985).

Again, the point to note is that the Azande make little distinction between what is said and its interpretation. My point is simply that the distinction was created by literacy. Literacy involved the preservation of a part of language — what was actually said, the "given", which could be contrasted with the interpretations assigned and the intentions that lie behind it. In an oral society there were, of course,

“texts”, fixed bodies of ritual and poetry, along with intentions and interpretations. All language necessarily involves all of those. But literacy provides the means for splitting those things apart, fixing part of its meaning as the text and permitting interpretations to be seen for the first time as interpretations. Goody (1985) has shown how religious reform movements rely upon just this distinction, calling for the abandonment of interpretations and a “return to the book”.

The twist in the understanding of interpretation which has been studied most carefully is the change in interpretation associated with the Reformation and the Counter-Reformation. As Stock has shown, the problem of heresy in the Middle Ages was almost exclusively associated with literacy. “Heretics had a highly-developed, if somewhat personal, style of ‘rationality’ which depended on individual interpretation of theological texts” (pp. 110-120). Heretics considered the teachings of the church to be mere interpretation, if not fabrication. Yet while heretics recognized the interpretations of the Church as interpretations — they were recognized as man-made — they did not recognize their own interpretations as merely interpretations. They, like the medieval church, took their interpretations to be the ones intended by God and, hence, they died, apparently happily, at the stake for them.

The church’s view of interpretation prior to the Reformation, as expressed for example in Aquinas’ *Summa Theologia* (written 1267-73) was that Scripture had several levels of meaning including literal meaning, spiritual meaning and moral meaning. All levels of meaning were “given” in the text. Reformation theology, as exemplified in Luther, denied that all these meanings were in the text: the literal, historical meaning was in the text, all the rest was “tradition” and “dogma”. Reformation theology, in a word, involved a sharp distinction between what was “given” by the text and the interpretations that one could make of a text. The latter were suddenly seen as subjective, fanciful and a product of the imagination. Thus, part of the meaning was moved from being seen as given by the text to being seen as invented by the reader. The interpretive principle of the Reformation, as expressed for example in Luther’s attitude to Scripture, was that Scripture is “autonomous”, it doesn’t need interpretation, it needs reading; it means what it says. All the rest is made up — a product of fancy or tradition. It was this distinction between the “given” and the “interpreted” which launched the Reformation and which, a century later, opened “the book of nature” to modern scientists, to make it readable to anyone “with a faithful eye” as Robert Hooke, one of the first of the seventeenth-century British empiricists, said.

## Epistemology

The hypothesis connecting hermeneutics with scientific epistemology is that hermeneutics provided the conceptual distinction between something taken as fixed or “given” and something else taken as “interpretation”. The scriptural text and its interpretation was seen as exactly parallel to the natural world and its interpretation. It was a commonplace in the Middle Ages to speak of nature as God’s book. The metaphor came to have a new meaning in the seventeenth century. Francis Bacon spoke of “the book of God’s word and the book of God’s work.” Thomas Browne, a seventeenth-century British cleric, talked of God’s two great books, Scripture and nature (Figure 1). Galileo complicated the story by claiming that: “The book of nature is written in the language of mathematics.” At first we may be tempted to believe that this is a mere metaphor. However, it may be argued that modern science was the product of applying the distinctions needed for understanding the book of Scripture, namely that between the given and the interpreted, to the book of nature. For modern science the “given” was the world of observed facts; all the rest, hypotheses, final causes, interpretation and inferences were invented, made up by man. These distinctions are fundamental to scientific epistemology. Modern science rests on the distinction between observation and inference, observations being objective and reliable while the inferences are theoretical interpretations of those observations. Recently, the distinction has come in for considerable revision, and I shall return to that problem later.

The modern scientists — Galileo, William Harvey, Robert Hooke, Robert Boyle, Isaac Newton and Francis Bacon — consistently and systematically distinguished facts from “hypotheses”. Science, Bacon said, consisted of the “statement of observed facts.” It involved no

**FIGURE 1:**  
**THE GIVEN-INTERPRETATION DISTINCTION IN HERMENEUTICS AND EPISTEMOLOGY**

BOOK OF SCRIPTURE [HERMENEUTICS]		BOOK OF NATURE [EPISTEMOLOGY]	
READ	INTERPRET	SEE	KNOW
SAY	MEAN	OBSERVATION	INFERENCE
	INTENTION	FACT	THEORY
		EVIDENCE	CLAIM
GIVEN	INTERPRETATION	GIVEN	INTERPRETATION
FRANCIS BACON (1605)		THE BOOK OF GOD'S WORK	
THE BOOK OF GOD'S WORD AND			
THOMAS BROWNE (1643)			
THERE ARE TWO BOOKS FROM WHENCE I COLLECT MY DIVINITY:			
THAT WRITTEN OF GOD, [AND THAT]		WRITTEN OF NATURE	

interpretations. William Harvey added: "For in every Science . . . a diligent observation is required." Bacon said it most strongly: "God forbid that we give out a dream of our imagination for a pattern in the world." The split was complete. Observation provided direct access to the "given"; theory and interpretation was the work of the imagination. Bacon again: "All depends on keeping the eye steadily fixed upon the facts of nature and so receiving their images simply as they are." They not only said it, they acted on it. Galileo and Newton are replete with denials of the relevance of purposes, goals, and causes in the explanation of motion and machines — they sought factual description, not theoretical interpretation.

So, "reading" the book of nature — that is, science — was simply applied hermeneutics. The distinctions worked up for reading and interpreting Scripture could be applied, without revision, to reading and interpreting the book of nature. Recall Bacon's plea: "God forbid that we give out a dream of our imagination for a pattern in the world." In science the distinction takes the form of an observation versus inference, fact versus theory, claim versus evidence, and a whole set of related concepts such as hypotheses, conclusion, conjecture, the set of concepts, educators will notice, that are so alien to school children's cognition. Children have little idea of the difference between an observation and an inference, or between a fact and a theory, or between a claim and evidence. If my argument is correct, these are sophisticated, literate concepts that, while important to "educated" activities, are not often honored in ordinary discourse. (The Watson-Glaser Test of Critical Thinking tests for just these concepts!) We are just beginning to examine children's knowledge of these concepts (see Olson & Astington, 1986).

### *Subjectivity*

There is a third prong to the argument which I shall discuss here only in passing. It is that if "interpretations" are not in the text, where do they come from? Interpretations came to be seen increasingly as subjective, that is, made up by the reader of texts or the observer of nature. It was this new subjectivity, I suggest, that provided the bases for Descartes' mind-body dualism and the priority of the mental: "Cogito, ergo sum" ("I think, therefore I am"). Bishop Berkeley's new theory of vision identified the reality with the workings of the mind — to be is to be perceived — the priority of the mental. Descartes, Locke, and Berkeley, I suspect, were as much a product of Lutheran hermeneutics as Bacon and Galileo were. A recent paper by Saenger (1982) connects the rise of notions of private consciousness and reflection with the development in the tenth-thirteenth centuries of silent reading, a suggestion that fits in well with this account.

*Children's Distinctions Between What Is Given  
and What Is Interpretation*

I would like to conclude by showing that these distinctions are, in fact, achieved by children in the early school years and that they are closely related, indeed that children succeed in recognizing the role of interpretation in what they hear at precisely the same time that they succeed in recognizing the role of appropriate interpretation in what they see. The claim is that children come to see "interpretations" as interpretations at the same time that they come to see inferences from perception as inferences. Let me report two experiments which my colleagues, N. Torrance and J. Astington, and I have performed to examine these relations.

Children's acquisition of the distinction between what is said and what is meant by it can be examined by looking at their reactions to ambiguous utterances. Nancy Torrance reads stories to young children ranging in age from 5 to 10 years which include referentially ambiguous utterances. A sample story will make this clear. In this case, the child is first shown a picture of Charlie Brown, Lucy and Linus, and also one showing three pair of shoes in a closet. The shoes are described as Lucy's new red party shoes, her old red running shoes and her ordinary blue shoes. The following story is then told:

*One Saturday night, Lucy and Charlie Brown were going to a party. Lucy was all dressed in her brand new red party dress, but she didn't have her shoes on. She wanted to wear her new red shoes to go with her party dress. Linus was upstairs so she called up to him, "Linus, bring me my red shoes." Linus went to Lucy's closet where she kept her shoes. Now Linus picked up the old red shoes and rushed down the stairs with them. He said, "Here are your red shoes" and he gave the shoes to Lucy. "Good grief," said Lucy, "how can you be so stupid?" and she gave him a whack on the head.*

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ing the eye...fixed upon the facts of nature and so receiving their ima-  
ges simply as they are." <sup>d</sup>  
<sup>b</sup> <sup>e</sup>

Following the story the children are asked a series of questions. Younger children's responses are illustrated by the following exchanges.

Q. Did Linus bring the shoes that Lucy wanted?

A. No

Q. Did he do what Lucy said to do?

A. No

Q. What did Lucy tell him to bring?

A. The red party shoes.

Q. What were the exact words that Lucy said? She said "Linus, bring me —"

A. My new red shoes.

Note that the child assumes an identity between what's said and what is meant by it. Elizabeth Robinson (1977) has characterized this kind of response as "listener blaming" because when asked "Whose fault was it?" younger children fail to note that the speaker is actually responsible for the failure because he/she provided an ambiguous message. Older children tend to blame the speaker and his message. In our study, older children's answers tend to run as follows:

Q. Did Linus bring the shoes that Lucy wanted?

A. No.

Q. Did Linus do what Lucy said to do?

A. No.

Q. What did Lucy tell him to bring?

A. The new red shoes.

Q. What were the exact words that Lucy said? She said "Linus, bring me —"

A. My red shoes.

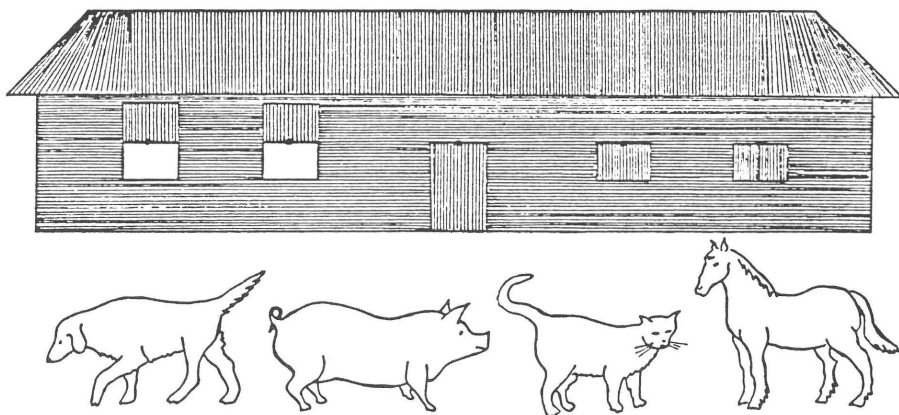
Bacon said it most strongly: "God forbid that we give out a dream of our imagination for a pattern in the world. All depends on keeping the eye fixed upon the facts of nature and so receiving their images simply as they are"

Notice that even here the second grade child answered the second and third questions in ways that are technically incorrect. In fact, Linus did do what Lucy said to do; he just didn't do what she wanted him to do. It is only in the last question that this child acknowledges what was actually said. By grade 4, however, the majority of children (75%) that have been tested respond accurately to all four questions. The data for this experiment are summarized in Table II. We interpret such results as indicators that with age and experience children come to distinguish what a person or a text "says" from what is "meant" by it. It is not a distinction directly tied to age but rather, here we just suspect, to the language and literacy practice of parents.

The critical part of my hypothesis is the following. It is the child's conceptual distinction between the given, namely, the text or wording, and its possible interpretation that provides the basis for the child's epistemological distinction between what he sees and what he knows. We examined that distinction in the following way. Janet Astington has prepared a series of cut-out animals, some of which were unambiguous in their coloring and some of which were ambiguous in a way analogous to the ambiguous sentences in the preceding experiment. Children were shown the collection of animals shown at the bottom of Figure 2. They were asked to identify these and to name their colors. When it was clear they knew them well, they were told that the animals would be hidden in the barn and they would be asked to find them. Copies of the animals remained in front of the child to ensure that the animals and their colors wouldn't be forgotten.

The barn and the visible parts of two of the animals is shown at the top of Figure 2. Only a sample of the color of the animal is visible in the window. In the case of the unambiguously colored animals, the

**FIGURE 2: ILLUSTRATION OF TASK MATERIALS**



child has grounds for identifying the animals; when the ambiguous pair is revealed in the other two windows, the child, of course, does not have grounds for identifying them. The question is, will young children recognize the ambiguity of the second pair and acknowledge that they don't know which animals they see?

The contrast is even more clearly drawn in the second half of the experiment. All of the materials except for a new barn are removed and a doll named Katie is produced. The child is told that Katie has not seen the animals and is asked to now answer the same questions about what Katie would see. The question sequence for both self and other is shown in Figure 3. Consider first children's responses when asked which they, themselves, see. A typical pattern of responding by a younger child is the following:

E: (Pointing to the window revealing a red animal) What do you see?

C: Cat.

E: Do you know it's a cat?

C: Yes.

E: How do you know it's a cat?

C: Red.

Older children do much the same thing on the unambiguous stimuli. More interesting is the younger child's response to the ambiguously colored animals. Here is a sample:

E: (Pointing to one of the two windows revealing blue animals) What do you see?

S: Dog.

E: Do you know it's a dog?

S: Yes.

E: How do you know it's a dog?

S: 'Cause it's blue.

It is not that the child is blind to the ambiguity; rather it is that the child has no conceptual means for dealing with it. Thus, the child may continue as follows:

E: (Pointing to the other window revealing the other blue animal) What do you see here?

S: Pig.

E: Do you know it's a pig?

S: Yes.

E: How do you know it's a pig?

S: 'Cause it's blue, too.

The child marks the similarity with "too" but the child fails to acknowledge the ambiguity and its role in the fact that one may see

something but not know what it is. The child fails, we say, to distinguish what one sees from what one knows. A similar pattern, but delayed by a year or two, occurs when the child is asked what the doll, Katie, sees. Here is a sample transcript:

E: (Pointing to the window revealing the red animal) What will Katie see?

S: Cat.

E: Will she know it's a cat?

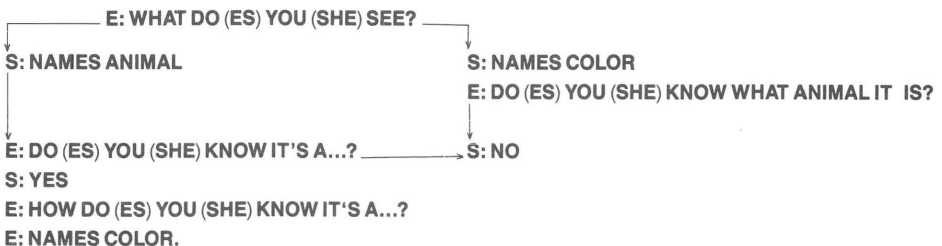
S: Yes.

E: How will she know?

S: 'Cause it's red.

As Table III indicates, this pattern shifts with age, although age is not, I suggest, the major factor, older children acknowledging that Katie would see the red but that she would not know what it was. Similarly, older children acknowledge that they themselves do not know what animal they see when the colors are ambiguous. We have conducted this study twice with somewhat different questions. In the first study (Olson and Astington, in preparation) the children who could handle the ambiguous stimuli for themselves, were the very children who could recognize that the doll would not know. In the present study, conducted by Nancy Torrance and me, the children were considerably better at acknowledging that they did not know, in the ambiguous case than they were at acknowledging that the doll, Katie, would not know what animal she was seeing. We are currently attempting to resolve these small differences. In general, older children appear to recognize the role of belief and knowledge in their

**FIGURE 3: SEE / KNOW QUESTION SEQUENCE FOR SELF AND OTHER**



**TABLE I: SAY / MEAN  
NUMBER OF SUBJECTS RESPONDING CORRECTLY**

GRADE	16-18 CORRECT	0-15 CORRECT
SK	3	13
2	8	8
4	12	4

$$x^2(2) = 10.8, p < .01$$

own and others' interpretation of their observations and perceptions while younger children appear to have no devices for differentiating what they see from the prior beliefs and knowledge that they use to interpret what they see.

The clinching part of the argument connecting notions of interpretation of texts to interpretation of perceptions would be provided by showing that precisely those children capable of solving the say-mean task also solve the see-know task. Our evidence to date presented in Table III is that the two are quite highly correlated ( $r = .53$ ) but not identical. However, it must be noted that the tasks are quite different in format, and perhaps difficulty, so a perfect correlation would be unlikely. In fact, Elizabeth Robinson (1980) has provided just the data we need. She gave her subjects two listener-blamer tasks which were identical in every way except that in one case the message was a set of words which was ambiguous while in the other it was the picture that was ambiguous. In her study the responses were exactly as expected: children who solved the verbal task were the ones who solved the pictorial task. This suggests that the same sets of categories were used in interpreting language as were used in interpreting perceptions. Conversely, when children worked up the appropriate conceptual distinctions for handling text, they could readily be applied to handling nature. We must note that the relation of these "literal" distinctions to the actual process of learning to read and write is indirect. One could learn to make them from oral discourse with literate parents. My preferred hypothesis is that they become sharpened in learning to write.

**TABLE 2: SEE / KNOW  
NUMBER OF SUBJECTS RESPONDING CORRECTLY**

GRADE	SELF		OTHER	
	4 CORRECT	0-3 CORRECT	4 CORRECT	0-3 CORRECT
SK	9	7	3	13
2	11	5	2	14
4	14	2	8	8
	$\chi^2(2) = 3.83, p < .10$		$\chi^2(2) = 6.54, p < .05$	

**TABLE 3: SAY / MEAN SEE / KNOW CORRELATIONS**

GRADE	SELF	OTHER
SK	.38	-.11
2	.53	.34
4	-.03	.28

## *Conclusions*

We began with the well-documented inference relating literacy to the social and psychological changes that occurred with the invention of alphabetic literacy in Greece and, more particularly, with the growth of literacy in the late Middle Ages and the early Renaissance. I argued that while the relation is well known, there was no theory connecting the Reformation with the rise of modern science or with Cartesian mentalism. I advanced the notion that the three were by-products of literacy and offered, as a mechanism for the change, the new conceptual distinction between what was given in a text and the interpretations a reader brought to or assigned to a text. I called it the given-interpretation distinction. I could as well have called it the reading-interpretation distinction (cf. Havelock, 1976). It was the hypothesis that something was given, invariant and autonomous about a text and that givenness could be contrasted with the interpretations of that text which were subjective, fallible, and the product of the imagination. That distinction I say was invited by literacy because writing, in fact, split the comprehension process into two parts, that part preserved by text, the given, and that part, the interpretation, provided by the reader. Printing sharpened just this distinction. With the exact duplication of the original text, free from copyist errors, that part "given" in the text was more readily distinguished from the "interpretation" brought to the text by the reader. In a single move the layers of meaning of Scripture which Aquinas had claimed to be in the text were suddenly taken by Luther to be mere additions and accretion or interpolations. Galileo followed the lead, taking Aristotle's notions of "final causes" as mere interpretation of motion, quite independent of the laws of motion themselves. The distinction between the given and the interpreted, then, invented for reading and interpreting texts, was simply borrowed for "reading" the book of nature. The product of the distinction was modern science, science built on the notion of a discontinuity between observation and inference, facts and theory, claims and evidence. Modern scientific epistemology was, therefore, a by-product of hermeneutics.

And finally, to show how language and the world would appear to someone who did not make these distinctions, I showed you how young children conflate what is said with what is meant and what they see with what they know. And I showed that at about the time that they "solve" the interpretation problem they solve the "observation" problem; their epistemology reflects their hermeneutics. And I suggested that the sorting out of the related distinctions such as say, mean, intend, interpret, as well as observe, infer, claim, evidence, fact, theory are both fundamental to education and to western thought generally, and are, if the above argument is correct, the cognitive consequences of literacy.

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