DOCUMENT RESUME

ED 248 481 CS 007 768

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TITLE Of Metaphors and Paradigms: Rejecting the "Commonsense" View of Reading.
PUB DATE 8 May 84
NOTE 15p.; Paper presented at the Annual Meeting of the International Reading Association (29th, Atlanta, GA, May 6-10, 1984).
PUB TYPE Viewpoints (120) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Comparative Analysis; Educational Philosophy; *Educational Theories; Physics; Reader Response; *Reading Comprehension; *Reading Instruction; *Reading Processes; Teaching Methods
IDENTIFIERS *Paradigm Shifts; Reader Text Relationship; *Theory Development

ABSTRACT

For many years, methods of teaching reading have been based upon a mechanistic paradigm that something can be understood by reducing it to its most basic parts. This scientific paradigm has led to several misconceptions about reading: (1) that comprehension can be reduced to separately identifiable parts, (2) that meaning is contained within the text and has no connection to the reader, and (3) that reading is a tangible thing rather than a process. These misconceptions encourage a false dichotomy between reading and comprehension. There is an organic paradigm emerging in physics that takes into account the transaction between "observer" and "observed," the so-called "quantum leap." There are several ways in which this modern paradigm parallels and lends support to the psycholinguistic schema-theoretic view of reading. First, there is no separation between observer and observed, reader and text, reading and comprehension. Second, the whole (universe, sentence, text) is not merely the sum of separately identifiable parts. Third, meaning is determined through transactions (between observer and observed, reader and text). Fourth, the basic nature of the universe and of reading is a process. (HTH)

OF METAPHORS AND PARADIGMS: REJECTING THE "COMMONSENSE" VIEW OF READING

Paper presented at the
International Reading Association
Atlanta, Georgia
May 8, 1984

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This work was supported by a Fellowship from the Faculty Research and Creative Activities Fund, Western Michigan University.

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When I first read the Nation at Risk report, I was struck by the following statement:

> Some worry that schools may emphasize such rudiments as reading and computation at the expense of other essential skills such as comprehension, analysis, solving problems, and drawing conclusions. (p. 12)

What concerned me about this statement was the dichotomy between reading on the one hand and comprehension on the other--as if reading were somehow different from comprehension, analysis, solving problems, and drawing conclusions. It seems to me that this simplistic "commonsense" notion of reading is all too typical among the general public, parents, and even reading educators.

What I want to do today, then, is not to discuss the Nation at Risk per se, but to demonstrate the inadequacy and inaccuracy of the "commonsense" view of reading that I think A Nation at Risk reflects. More specifically, I want to suggest how metaphors, paradigms, and concepts from modern science, particularly subatomic physics, parallel and thus in my opinion lend support to a psycholihguistic/schema theoretic view of reading.

For all too long, our methods of teaching reading have been based upon a limited but pervasive scientific paradigm, the mechanistic view of the universe that has dominated Western thought since Descartes in the seventeenth century. Descartes assumed the universe to be a well-made machine, like a clock with perfectly synchronized parts. Just as the

workings of a clock can be understood by taking it apart and putting it back together again, so the workings of the universe, Descartes thought, can be understood by reducing it--and everything in it--to its basic parts. Once these parts are understood, according to the paradigm, they can be a reassembled into a functioning, viable whole.

In reading, this paradigm has led to several misconceptions that typically pervade our educational practices, even when teachers' understanding has progressed beyond the paradigm. First is the misconception that the whole (comprehension, let us say) is simply the sum of separately identifiable parts. Second is the misconception that the meaning of a text is contained within the text, without reference to the reader. Third is the view that reading is fundamentally a thing, comprehension, rather than a process, the process of comprehending. Entrenched in our educational materials and practices, these misconceptions encourage the false dichotomy between reading and comprehension.

I. THE "NEW" PHYSICS . . . AND A "NEW" PARADIGM

Though the mechanistic paradigm that has led to such misconceptions still dominates our "commonsense" view of reality, modern physics has demonstrated the limitations of this paradigm. The shift in perspective, the shift to an organic rather than a mechanistic paradigm, began shortly after the turn of this century. Nearly a century before that, in 1803, Thomas Young had demonstrated that light has the properties of a wave. Then, in 1905, Albert Einstein "proved" just as incontrovertibly that light has the properties of a particle! Since no one has been able to disprove either conclusion, we are left with a paradox: light is both a wave and a particle, though not both at the same time. As Gary Zukav observes in The Dancing Wu Li Masters, "The wave-particle duality marked the end of the 'Either-Or' way of looking at the world" (1979, p. 65).

Light has the potential, then, to be both a wave and a particle. But how do we know when it is which? We know only by observing it. If we choose to observe light by means of the double-slit experiment that Young used, we find that light is a wave. If we choose to observe light by using the photoelectric effect that Einstein used, we find that light is a particle. In essence, we make light be either a wave or a particle, depending on how we choose to observe it. The mutually-exclusive wave-like and particle-like behaviors are not the properties of light itself but of our interaction; or rather our transaction, with it (Zukav 1979, p. 93).

As you can readily see, conclusions like these differ markedly from the viewpoint of classical physics, which we have learned to accept as "commonsense." We have learned to think of objective reality as separate from subjective reality, from mind: things are what they are, regardless of whether or how we observe them. Quantum mechanics, the study of subatomic phenomena, challenges this view. Physicists assert that at least in the subatomic realm, a human observer cannot observe or measure anything without affecting its very nature. Thus while classical physics spoke of interactions between separate, independently characterizable entities (such as an observer and the observed), modern subatomic physics speaks of transactions between entities that are in some way defined through the act of relating to one another (Dewey and Bentley 1949, p. 108). Thus particles and waves are events, transactions between observer and observed.

The transaction between "observer" and "observed" results in the so-called "quantum leap." When predicting individual events, the physicist can only calculate the probability of their happening, whether the possibilities be myriad or only two. For example: when a human observer

intervenes to measure some aspect or quality of a particle, such as its position or momentum, the person actualizes one possibility (makes it happen) and collapses all the other possibilities (negates the possibility of their happening). This event involving the collapsing of possibilities is what is called a quantum leap. That is, the quantum leap involves the simultaneous actualization and negation of possibility.

Because of phenomena and concepts such as these, modern physicists, at least those investigating what they call the "microscopic" aspect of reality, typically reject the mechanistic paradigm, the metaphor of the universe as a clock or machine. While acknowledging that the mechanistic paradigm has led to magnificent insights and achievements, they believe it does not accurately reflect the fundamental nature of the universe. Rather, they suggest that the universe is more like an organism, with no clear separation between subjective and objective, observer and observed, mind and matter.

To tie things together, I would like to summarize several of the basic tenets of this organic model offered by quantum physics, tenets that I think have particular relevance for our understanding of the reading process: First, the world cannot be analyzed into separately identifiable parts that can be recombined to produce the whole. There are two reasons for this. One is that the parts are not separately identifiable: they are identifiable only in transaction with an "observer," and their very nature is determined by this transaction. A second reason is that the parts are not really parts anyway. They are events that persist only momentarily. No sooner do we identify a particle than it typically collides with other particles in a burst of energy that annihilates the original particles and creates new ones.

A related tenet of quantum physics is that the fundamental nature of the universe is activity, process. Zukav notes that "The search for the ultimate stuff of the universe ends with the discovery that there isn't any" (1979, p. 193). Particles are energy, energy in constant transformation. Fritjov Capra explains in The Turning Point that "Atoms consist of particles, and these particles are not made of any material stuff. When we observe them we never see any substance; what we observe are dynamic patterns continually changing into one another--the continuous dance of energy" (Capra 1982, p. 91). Or as Zukav says, "The subatomic world is a continual dance of recreation and annihilation, of what appears to be mass changing to energy and energy changing to mass. Transient forms sparkle in and out of existence creating a never-ending, forever-newly-created reality" (1979, p. 197). "At the subatomic level," Zukav continues, "there is no longer a clear distinction between what is and what happens, between the actor and the action. At the subatomic level the dancer and the dance are one." Thus insofar as the rational mind has been able to determine, the universe is fundamentally "dancing energy" (Zukav 1979, p. 193).

II. NEW PARADIGMS IN READING AND LITERARY THEORY

While Albert Einstein began challenging the foundations of classical physics with his discovery that light is a particle as well as a wave, Edmund Huey was conducting experiments and gathering evidence that a mechanistic "building block" theory of reading is not merely inadequate, but inaccurate (The Psychology and Pedagogy of Reading, 1908). He determined, for example, that four-letter and even eight-letter words can be identified almost as rapidly as individual letters, thus suggesting

that word identification does not ordinarily proceed from the identification of individual letters.

In fact, words can be identified under conditions that make it impossible to identify individual letters, and letter identification can, and normally does, proceed from the identification of words. To get some idea of how letters transact in word identification and how the identification of words facilitates letter identification, suppose for a moment that you are at the opthalmologist's trying to read the wall chart at the end of the room. Suppose you can tell that the first letter is either an a or an e and the next letter is either an f or a t. If the opthalmologist were to tell you that the two letters make a common English word, you would immediately identify the word as at and the letters as a and t. Notice that you would identify the word first. In this case, the information that the two letters make a common English word stimulates the "quantum leap," the actualizing of the first possibility as a and the second as t. (adapted from Smith 1978, p. 125).

Similarly, to see how words are defined in transaction with one another and how grammatical structure facilitates word identification, think for a minute of how you would define the following words: fire, part, baste, wash, oil, cook, coat, roast, sort. Now see how appropriate your definitions are in the following contexts: Fire the cook, Baste the roast, Coat the part with oil, Sort the wash. In these cases, of course, grammar--word order and function words, like the--tells us the part of speech, and the part of speech in most of these cases is a major clue to the meaning. But take the case of t-e-a-r, as in Chris has a t-e-a-r in her . . . . Is it /tihr/ or /tehr/? We don't know until we know the following word, jeans. Take one more example, the word easy. We know it's

usually an adjective, and we have a general idea of its meaning--or at least we think we have. But what does it mean in each of these sentences: Chris is easy to please, Chris is easy on the employees; Chris is easy?

In the reading process, then, there is a hierarchy, or better yet, a three-dimensional lattice, of transactions--letters are defined in nonlinear transaction with one another, words are defined in nonlinear transaction with one another, and so forth, on up to the level of texts. However, these is also a constant interplay between and among levels, as we saw with the a, e . . . f, t example. The word at could be identified when the letters separately could not, and thus the letters could be determined from the word rather than vice versa. Similarly, the meanings of the words fire and cook could be determined in the sentence Fire the cook, whereas in isolation the words had only potential meanings. Imposing a sentence structure on them actualized one of their possible meanings, in a "quantum leap."

In modern literary theory, the beginnings of the notion that meaning is an event, a transaction, a process can be found in Louise Rosenblatt's Literature as Exploration (1938), where she indicates that a literary work is a transaction between reader and text (p. 27, n. 1). Rosenblatt clarifies this concept in The Reader, The Text, the Poem (1978). She explains that the Text itself is the word-symbols and patterns created by the writer; it is not yet a literary work. What the Reader brings to the Text is crucial in determining the work. The Reader brings his or her schemata, the reader's storehouse of knowledge and experience. The reader's schemata are as transitory as the physicist's particle. Ulric Neisser explains that a cognitive schema is "a momentary state of the perceiver's nervous system" (Neisser 1976, p. 181). During the

reading of the text, the transaction between Reader and Text, the reader's schema are modified and the Poem (by which Rosenblatt means any literary work, poetic or not) is simultaneously created. Rosenblatt elaborates:

> The poem, then, must be thought of as an event in time. It is not an object or an ideal entity. It happens during a coming-together, a compenetration, of a reader and a text. The reader brings to the text his past experience and present personality. Under the magnetism of the ordered symbols of the text, he marshalls his resources and crystallizes out from the stuff of memory, thought, and feeling a new order, a new experience, which he sees as the poem. This becomes part of the ongoing stream of his life experience, to be reflected on from any angle important to him as a human being. (p. 12)

To borrow terminology from the physicist/biologist David Bohm (1980), the Poem is implicit in the collocation of reader and text. The Poem is made explicit, is actualized, during the transaction between the two. In effect, the reader triggers a quantum leap: by interpreting the text in a particular way, by actualizing one particular "Poem," the reader simultaneously negates, for that moment in space/time, all other possible "Poems."

III. THE DANCE

In summary, then, there are several ways in which the metaphors, paradigms, and concepts from modern science, particularly subatomic physics, parallel and thus lend support to a psycholinguistic/schema theoretic view of reading. In sharp contrast to the "commonsense" view of the universe and of reading, together they assert, on the basis of concrete evidence, such revolutionary concepts as the following:

1. There is no sharp separation between observer and observed, reader and text, reading and comprehension.
2. The whole (universe, sentence, text) is not merely the sum of separately identifiable parts.

3. Meaning is determined through transactions (between observer and observed, reader and text).

4. The basic nature of the universe and of reading is process.

Clearly this organic view is in sharp contrast to the mechanistic model which is so widely accepted. Or to put it another way, we might say, with Zukav: "our commonsense ideas about the world are profoundly deficient" (p. 300).

I'd like to close by returning to the dance metaphor adopted by many quantum physicists. Just as the universe may be viewed as fundamentally a dance of transient forms that sparkle in and out of existence, so meaning, the Poem, may be viewed as an ever-fluctuating dance that occurs more or less simultaneously on and across various levels: letters, words, sentences, schemas; writer, text, and reader; the present reader with other readers, past and present; and so forth; all connected in an interlocking network or web of meaning, a synchronous dance in which there is no clear distinction between what is and what happens. As Yeats expressed it in "Among School Children,"

> O body swayed to music, O brightening glance,
> How can we know the dancer from the dance?*

It is worth noting, I think, that a metaphor is more than a convenient way to visualize something. As Lakoff and Johnson point out in Metaphors We Live By, "Much of cultural change comes from the introduction of new metaphorical concepts and the loss of old ones" (1980, p. 144). Metaphors, models, and paradigms are primarily means of structuring our

*Alas, I discovered I was not the first to think of using this metaphor from Yeats in a similar context. Rosenblatt used it in an essay titled "The Performing Art" (English Journal, November 1966); the essay is reprinted in the 1976 edition of her Literature as Exploration.

conceptual system, and our conceptual system in turn affects how we perceive reality (Lakoff and Johnson, 1980, p. 146). As Zukov says, "An ancient paradigm is [re]emerging, in which each of us shares in the creation of reality" (1979, p. 91). "The Cogs in the Machine have become the Creators of the Universe" (1979, p. 114), dancers in the eternal dance.

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1984

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Inadequate/inaccurate "commonsense" concepts of reading, reflecting a mechanistic paradigm

1. Reading is different from comprehension, analysis, solving problems, and drawing conclusions.

2. The whole (comprehension, let us say) is simply the sum of separately identifiable parts.

3. The meaning of a text is contained within the text, without reference to the reader.

4. Reading is fundamentally a thing, comprehension, rather than a process, the process of comprehending.

"New physics" concepts of the universe and psycholinguistic/schema theoretic concepts of reading, reflecting an organic paradigm

1. There is no sharp separation between observer and observed, reader and text, reading and comprehension.

2. The whole (universe, text, sentence) is not merely the sum of separately identifiable parts.

3. Meaning is determined through transactions (between observer and observed, reader and text).

4. The basic nature of the universe and of reading is process.

Dance metaphor--the universe is fundamentally dancing energy
reading and literary experience are a dance

Recommended reading

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Zukav, Gary. The Dancing Wu Li Masters: An Overview of the New Physics. New York: Bantam, 1979.