

Jan Anward

# Semiotics in Educational Research



In: *International Encyclopedia of Educational Research*, vol. 9, Pergamon Press, 1994, 5411-5417. Reprinted in *Educational Research, Methodology, and Measurement: An International Handbook, Second Edition*, Pergamon Press, 1997.

Semiotics is, in the words of its two founders, the Swiss linguist Ferdinand de Saussure (1857 - 1913) and the American philosopher Charles Sanders Peirce (1839 - 1914), the study of "the life of signs within society" (Saussure 1916: 33) and "the essential nature and fundamental varieties of possible semiosis" (Peirce 5.488), semiosis being the process whereby something comes to stand for something else, and thus acquires the status of sign. Since education, like all social activities, is crucially a sign-mediated activity, semiotics has an obvious bearing on the study of educational phenomena. Educational semiotics can easily be defined as the study of the life of signs and the fundamental varieties of semiosis within education.

**Signs.** Semiotics does not begin with Peirce and Saussure. A theory of verbal signs, chiefly words, was articulated already by the ancient Greeks, most notably by the Stoics, who developed a fully modern theory of verbal signs. According to the Stoics, a spoken or written word which is used on some occasion to stand for a particular object, its referent on that occasion, does not relate directly to its referent. It would be misleading to simply regard the word as a name of that referent. A word unites a form, a signifier, and a concept, a signified, and it is through this connection that a word may stand for a referent, or, to be more accurate, an unlimited number of referents. Every phenomenon that falls under the concept linked to a certain word form may be a referent of the word constituted by that word form and that concept. To the Stoics, signifiers and referents are 'bodies' and 'sensible', while signifieds are only 'intelligible'. In an admirable operational definition, signifieds are defined as that which the barbarians can not grasp when they hear Greek - in contrast to signifiers and referents, which are available to both Greeks and barbarians.

The Stoic theory of verbal signs was taken up and elaborated by Peirce and Saussure, and generalized from a theory of verbal signs to a theory of signs in general, which was the founding moves of semiotics. In Peirce, the Stoic triad of signifier, signified, and referent surfaces as a triad of sign (or representamen), interpretant, and object. "A sign stands *for* something *to* the idea which it produces, or modifies. ... That for which it stands is called its *object*; ... and the idea to which it gives rise, its *interpretant*." (Peirce 1.339). Signs are not a discrete class of phenomena, though. Anything can be a sign, provided that it enters a process of semiosis, where it "determines something else (its *interpretant*) to refer to an object to which itself refers (its *object*) in the same way, the interpretant becoming in turn a sign, and so on *ad infinitum*" (Peirce 2.300). A remarkable feature of this definition is the notion that the process of semiosis does not stop with the immediate interpretant of a sign. An interpretant is itself a sign, with its own interpretant, which in turn is a sign, and so on. As Eco (1976: 69) puts it: "the very definition of sign implies a process of *unlimited semiosis*". In fact, it is this process of unlimited semiosis that is the true object of Peircean semiotics, signs being just more or less stable products of this process.

It is in this perspective that Peirce's famous distinction between index, icon and symbol should be understood. This distinction is an attempt to generalize and solve the classical semiotic problem posed already by Plato in the dialogue *Cratylus*: How is a word related to the things it stands for? Does the word somehow 'reside' in the things it names, being, for example, the characteristic sound of these things, or is it just a conventional label for these things? In the dialogue, Socrates explores the view, held by Cratylus, that words have meaning naturally, using analogies between the way sounds are made and phenomena denoted by words containing such sounds as evidence for natural meaning. For example, the l sound is motivated in leios (slippery), because there is an analogy between the property that the word denotes and the loose and liquid way in which l is produced. However, Socrates also notes cases where l is out of place, as in skle@rotes (hardness), and concludes therefore that both convention and nature must be recognized as sources of meaning for verbal signs.

An index is a signifier which is spatio-temporally connected to its referent, the referent often being the cause of the signifier, as when smoke stands for fire, and tracks for an animal. An icon is a signifier that resembles what it stands for in some respect. Photographs and painted portraits are icons, as are pantomimes and onomatopoeic words, such as cuckoo. Peirce further subdivides icons into images and diagrams. In an image, each part of the signifier, as well as the way the parts are related, should bear some resemblance to its object, while in a diagram, only the relations among the parts need be iconic. Thus, a portrait of a face is an image, while a histogram comparing, say, the amount of literacy in Sweden with the amount of literacy in Great Britain is a diagram. A symbol, finally, is a signifier which is only conventionally related to its object - by rule, as Peirce puts it.

Index, icon and symbol are normally taken as a classification of signs. But that is misleading, and not in line with Peirce's intentions. What Peirce classifies is rather semioses, ways in which something comes to stand for something else. Semiosis can arise through causation (index), through resemblance (icon), or by rule (symbol), and one and the same sign may combine all these kinds of semioses. Consider, for example, a device which signals that there is too little water in a container. Since the signal is caused by the water sinking below a certain level, the device is an index. If furthermore the signal consists in lighting up an image of an empty container, then the device is also an icon. Finally, if the meaning of the device is "Fill the container with water, before you go on!", as opposed to, say, "Go on!", then the device is also a symbol. In other words, the semiosis which links the device to the water level in the container, combines semiosis through causation, resemblance, and rule. To Peirce, this kind of composite semiosis is the typical case of semiosis.

A number of developments in semiotic theory have underscored the importance of composite semiosis. Already Peirce extends indexical semiosis to verbal signs, the most typical symbols there are, to account for what is

traditionally called deictic expressions, i.e. expressions that refer to some aspect of the speech event, such as I, you, here, there, now, and then. Deictic expressions are 'shifters': what is described by here at one occasion need not be so describable at another occasion. This makes the spatio-temporal link between such signifiers and their referents a necessary component of their semiosis. At the same time, rules are clearly involved, since the form of deictic expressions is conventional. Garfinkel (1967; see also Heritage 1984, ch. 6) generalizes this idea, arguing that every act of description has an indexical component to it. In fact, it is precisely this indexical component that allows a signifier to stand for a particular referent, through the mediation of a general signified. What book stands for on a particular occasion depends on the spatio-temporal context in which it is used.

Jakobson (1971b) argues that verbal signs have a significant iconic component, as well. For example, a plural noun is normally marked by a separate affix, as opposed to a singular noun, which has no number affix. This makes pairs of singular and plural nouns, such as book - books, into diagrams, where a contrast between a lesser and a larger quantity is expressed by a contrast between a shorter and a longer form. Another example are pairs of expressions with the meaning of 'here' and 'there'. There is an overwhelming tendency in the world's languages to use a front vowel, such as i, in the word meaning 'here', and a back vowel, such as o or a, in the word meaning 'there' (see e.g. Tanz 1971). German hier - da and French ici - là exemplify this tendency. This makes diagrams out of 'here' - 'there' pairs, the relative distance of the tongue from the speaker's face at their syllable nuclei mirroring the relative distance from the speaker of the indicated place. A word such as ici thus resembles the device for indicating water level described above, in that it combines indexical, iconic, and symbolic semiosis.

In the other direction, Eco (1976) argues that there are no pure icons, that resemblances that constitute icons always require correspondence rules to be recognized. For example, whether

U

is to be interpreted as the letter U or as an empty container depends on which correspondence rules are used.

**Codes.** The distinctive contribution of Saussure to semiotics is his demonstration of the role of codes in semiosis. Saussure takes the Stoic model of the verbal sign, including the terminology of sign, signifier, and signified, as his point of departure, but argues that neither signifier nor signified should be regarded as an object or 'body'. Just as the signified allows a sign to stand for an unlimited number of referents, the signifier

allows an unlimited number of forms to stand for such referents. Each production of a word form is unique, but two such productions can nevertheless be interpreted as instances of the same word. So just as the signified is a concept, and not an object, the signifier is a concept, too, a sound concept. Saussure also follows the Stoics in saying that the relation between the signifier and the signified of a particular sign is arbitrary, not motivated by the nature of the signifier and the signified. Verbal signs are thus Peircean symbols, according to Saussure. However, the Saussurean notions of signifier and signified transcend all previous theories of signs. To Saussure, a verbal sign is not a pairing of independently given concepts. On the contrary, a verbal sign can only exist as part of a larger system of signs, a code. And this is because an arbitrary sign can be motivated only by a code. If a sign is not motivated by an inner relation between signifier and signified, or by being grafted onto an already existing code, then the nature of its signifier and signified can only be determined in relation to other signs, through the ways in which the sign differs from other signs, with which it contrasts and combines. For example, in a small subsystem containing only the words cow, horse, moo, and neigh, cow is defined through its contrast with horse, and its ability to combine with a following moo, but not with anything else.

However, the position of a sign within a system or subsystem of signs does not determine its full meaning, but only its value. The full meaning derives from that value being applied to some domain of reference. In the terminology of Hjelmslev (1943), a content form (the value of a sign's signified) is applied to a content matter (domain of reference), yielding a content substance, i.e. the matter organized by the form. For example, when cow and horse are applied to the domain of domesticated animals, phenomena in this domain will be organized by two broad and non-overlapping categories. For orthodox structural linguists, such as Saussure and Hjelmslev, content matter is always organized by language. However, more recent research on, among other things, color terms and terms for shapes suggest strongly that many domains are in fact pre-organized by language-independent perception and cognition, which means that verbal signs pertaining to such domains become labels of already existing categories, rather than category-creating devices.

The most important relations organizing a system of verbal signs (Saussure's *langue*) are paradigmatic and syntagmatic relations. Paradigmatic relations hold among contrasting items, items which can substitute for each other in a given position. Syntagmatic relations hold among items that can be combined with each other to form a larger unit. Thus, in the small subsystem presented above, there is a paradigmatic relation between cow and horse, and between moo and neigh, and a syntagmatic relation between cow and moo, and between horse and neigh. As shown by Roman Jakobson (e.g. in Jakobson 1971a), items organized by paradigmatic relations often exhibit a logic of markedness, whereby one the items, the unmarked item, contrasts with a set of more informative items, the marked items. For example, in Swedish the paradigm ko (cow), tjur (bull), and kalv (calf),

contains the marked items tjur and kalv, and the unmarked item ko. As Jakobson puts it, ko, the unmarked item, can be used either to signal the absence of the properties implied by the marked items, 'male' in the case of tjur and 'child' in the case of kalv, or the absence of signalling of these properties, in which case the unmarked item is used as a generic term for the domain covered by the entire paradigm. Jakobson also suggests that markedness is normally diagrammatically iconic, the greater semantic complexity of marked items being matched by greater formal complexity. This can be seen clearly in the Swedish paradigm, but not so clearly in the corresponding English paradigm.

Saussure stays within the Stoic theory in that his notion of sign, unlike Peirce's, does not incorporate a process of unlimited semiosis. In later developments of Saussure's theory, by Hjelmslev (1943) and Barthes (1964), the possibility of further semiosis, beyond the primary signified, is introduced. Hjelmslev proposes a process of connotation, whereby an entire sign is made into a signifier that is associated with a new signified, as when the image of a cross, or the word cross comes to signify Christianity. Most of what is called symbolism would thus come out as Hjelmslevian connotation, and Peircean unlimited semiosis can be reconstructed as a series of connotations.

Recently, the idea that meaning beyond primary signifieds is coded has come under attack. Sperber & Wilson (1986) argue that such meaning is never coded, but always a product of context-dependent inferencing. Thus, the meaning of John Heartfield's famous picture where the branches of a Christmas tree are bent to form a swastika, something like 'Nazi oppression extends to every aspect of life', would not be a coded meaning, but the result of a complex inferential process, taking the picture and a variety of contextual assumptions as premises. Sperber & Wilson's argument has considerable force, particularly in view of the context-dependency and open-endedness of connotational meanings. There is, however, a residue of coded connotations, where the meaning is too stable to be derivable in the Sperber-Wilson way. The example of a cross signifying Christianity, contrasting with a half-moon, a lotus flower, a wheel, a sun, etc. is a case in point. Such cases are probably best regarded as conventionalized inferences, which short-circuit the normal inferential process. But this residue does not affect the essential point of Sperber & Wilson's argument, which is a generalization of Saussure's ideas about the code dependency of signs to all kinds of signs. In other words, there can be no semiosis without a code. What appears to be semiosis without code is simply inferencing.

**Codes in Educational Activities.** The basic point of Peircean semiotics is that anything can be a sign. The basic point of Saussurean semiotics is that being a sign entails being part of a code. The study of the life of signs and the fundamental varieties of semiosis within a particular social activity will thus be a study of the various semiotic codes operating

within that activity, their nature, function and interaction. The semiotic codes operative within education will here be discussed primarily in relation to the activity of teaching through classroom interaction.

Teaching is the activity of bringing about learning with respect to something (Hirst 1973), In classroom interaction, this activity has the following basic components to it, involving one or more teachers (A), one or more students (B), and some kind of subject matter (C):

- (i) A brings it about that
- (ii) B learns something about C, L(C),
- (iii) by presenting L(C) to A.
- (iv) B demonstrates that
- (v) B has learnt L(C),
- (vi) by presenting L(C) to A.

Semiotic codes are called on to ensure presentation of the subject matter, to display what is to be learnt or has been learnt about it, and to maintain the frames of the activity itself, differentiating it from other activity types and identifying it as teaching. Semiotic codes provide for these functions by securing the intelligibility of states and events in the activity as signs that stand for some aspect of the subject matter at hand, mark some aspect of the subject matter as involved in learning, and/or indicate some aspect of the encompassing activity. Signs which stand for some aspect of the subject matter at hand elaborate the *topic* of teaching; signs which mark some aspect of the subject matter as something which is to be learnt or has been learnt elaborate the *text* of teaching; finally, signs which indicate some aspect of the activity in which it is embedded elaborate the *activity* itself (Anward 1992).

The simplest elaboration of the activity of teaching is the signification of 'This is teaching'. This message is indexically signified by the presence of certain persons and objects at a certain place at a certain time, as well as by the spatial organization of these persons and objects at that place at that time. Consider the following quotation from Byers & Byers (1972: 19): "At another time, in the same [nursery] school, there were two boys who, at the beginning of the year, often behaved wildly and 'tore up the classroom'. By midyear their relation to the other people in the classroom was proceeding more peacefully. Then, one morning the two boys suddenly swept all the large building blocks off the shelf onto the floor. The teacher recalls asking herself, 'Why did they do that? What is different in the room today?' When she looked around the room she saw an adult who was new and a stranger to the class. So she went up to the boys and said, 'Do you want to know who that person is?' They nodded yes. The teacher said, 'I think you know the words to ask that question. Now please put the blocks back, come over and sit down, and I'll tell you who she is.' The boys put the blocks back and went to the teacher, and she introduced them to the newcomer." Two things are important in this example. First, the presence of an un-introduced person in the classroom was sufficient to change a signifier of teaching into a

signifier of something else, at least for the two boys. Secondly, this does not mean that the signifier of teaching could not be changed. It was changed, to include the newcomer, but that had to be made in the proper way, by the teacher.

The spatial organization of persons and objects in the classroom is not only a conventional index of the activity of teaching, but also a diagram of the relations of power and distance that hold between teachers and students. Elevation of the teacher's desk, orientation of students towards that desk, significant tools within the reach of the teacher, but not of the students, are among those relations that diagram teacher control over students and tools, and these relations are also typically manipulated in pedagogical experiments of various kinds. The outcome of such experiments is crucially dependent on whether relations of power and distance in the classroom are shaped by the spatial organization of persons and objects in the classroom or have an independent basis, i.e. whether the content matter is pre-organized or not. If it is pre-organized, if power relations depend on other things than spatial organization, then making the signifier of teaching less iconic of such relations will have little effect on teaching itself, although it may have some effect on learning.

Another elaboration of the activity of teaching is provided by signifiers which elaborate the temporal organization of a lesson. Framing markers (Sinclair & Coulthard 1975) index its beginning, its end, and the boundaries between its various phases. The school bell is the most salient framing marker, but a framing marker may also be a shift of position or gaze, a gesture, possibly involving a tool, such as a chalk or a pointer, a word such as OK, well, and now, or some combination of these devices. Another aspect of the temporal organization is turn-taking. There are conventional signifiers to indicate a wish to take a next turn, at speaking or at some other kind of task, such as raising a hand and/or uttering a vocative, and there are conventional signifiers to nominate the one whose turn it is: looking, pointing, uttering 'yes' and/or uttering a vocative.

The activity of teaching is also elaborated through representational means. Both the identity and the temporal organization of teaching can be the topic of classroom talk, as when students are told that they are at school and nowhere else, and entire lessons, as well as phases of lessons, are overtly structured by introductions and summaries. Furthermore, the identity and the temporal organization of teaching are also connoted by classroom talk. An utterance such as Open your books at page 46! indexes both a preceding temporal boundary and, by soliciting a teaching-specific action, the very activity of teaching.

Topic is elaborated by a web of signifiers from a wide variety of semiotic codes: gesture, pantomime, non-verbal sound, picture, film, sign language, spoken language, and written language. Consider, for example, a possible lesson on Columbus' voyage to America. Besides a substantial amount of talk on Columbus and related issues, the lesson involves a written text,

which is required reading before the lecture, as well as a self-instructing work sheet. The teacher introduces the topic by asking questions about the written text, then moves on to a lecture phase, which is illustrated by pictures in the text book, and by a short animated sequence shown on video, where Columbus' three ships are seen moving across the Atlantic Ocean. The teacher's talk is accompanied both by gestures, as when a flat horizontal right hand, with the palm down, illustrates a flat Earth, and a sphere made by two cupped hands, with palms down, first separating, then moving in downward half-circles, and finally meeting, with palms up, illustrates a round Earth, and by a pantomime, including a variety of non-verbal sounds, which illustrates the restlessness of the crew. In the final phase of the lesson, the students work through the self-instructing work sheet, writing answers to printed questions, making a few calculations, and drawing Columbus' route on a printed map. For some further relevant examples, see Beckmann (1979) on graphic methods of proof in mathematics, and McNeill (1979) on gestures accompanying talk about mathematical issues.

Assessing the roles of the various codes in the didactic web involves at least two basic issues. The first issue concerns the expressive efficacy of the various codes. This issue is a tangled one (see Goodman 1969, 1978, Benveniste 1981, Baron 1981, Nadin 1984, and Sonesson 1989 for discussion), but some results apparently stand, the most important of which is that verbal codes (sign language, spoken language, and written language), but not non-verbal codes (gesture, pantomime, non-verbal sound, picture, film), have the capacity to establish secondary deictic centers, at which represented events can be located. In other words, only the verbal codes can provide for equivalents of the following opening of a story:

*It was a cold night in Lisboa, Portugal, in 1492.  
If the full moon had not been shining, it would have been  
pitch dark.*

The non-verbal codes generally have no equivalents of the italicized portions of this opening, and it is precisely these portions of the opening that locate the represented event in time (in 1492), physical space (in Lisboa, Portugal), and 'logical space' (as the real alternative of an unreal possible world, where the moon was not shining and it was pitch dark). This suggests not only that the verbal codes are indispensable in any kind of topic-elaborating teaching, but also a very specific role for these codes in such teaching, namely the role of anchoring code, that code which is used to establish the topics which are elaborated by the didactic web.

The role of anchoring code is not the same as the role of interpreting code, introduced by Benveniste (1981). An interpreting code is a code in which all messages of all codes can be interpreted. For Benveniste, the verbal codes are interpreting codes of all semiotic codes, including the verbal codes themselves. Within a particular social activity, such as teaching, we designate as interpreting code that code in the web of codes of that activity, in which

all messages emanating from the entire web can be interpreted. While the verbal codes are cast in the role of anchoring code in teaching, it is not clear that they always constitute the interpreting code. There is pictorial information, involving e.g. design and architecture, that is quite impossible to capture verbally. For relevant discussion, see Nadin (1984).

The second basic issue relating to the composition of the didactic web is the issue of didactic efficacy: What is the optimal composition of the didactic web for various combinations of subject, background, and goal? In the studies reviewed by Beckman (1979), for example, it was found that graphic methods of proof facilitated learning of mathematics for students with a humanistic background. This may suggest that, for these students, the graphic code took on the roles of anchoring code and interpreting code, with respect to the arithmetic code.

The issue of didactic efficacy is intimately connected with the third function of signs in teaching, that of elaborating the text of teaching. In practice, multiple coding of a certain message is often used to mark that message as part of what is to be learnt, as opposed to what is just said or shown during a lesson. A very simple technique is to repeat a spoken message at least once, and then present a record of that message, in the form of a written message or a picture, on the blackboard or on an overhead (Anward 1992). Thus, in actual teaching, requirements of multiple coding arising from considerations of didactic efficacy may be superseded by the text-marking function of multiple coding. To complicate things further, explicit text-marking may itself be an essential factor in didactic efficacy.

A series of didactic texts established about a topic will organize that topic into a subject part and a non-subject part, sustaining a pattern of classification and framing, in the sense of Bernstein (1977). Signs used to establish a certain subject, e.g. scientific terms, sentences expressing laws and facts, and graphic representations of various kinds, will then come to index that subject, and, since the subject is itself an index of teaching, the very activity of teaching. Thus, a piece of talk or writing containing species will connote 'This is biology', which in turn connotes 'This is teaching'. Furthermore, elaboration of a non-subject topic, or elaboration of a subject topic through non-subject signs will be taken as signifying non-teaching.

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