Knowing and guessing:
How do 9 year olds approach the meaning of visual signs in weather charts?

Maria Papadopoulou (Volos, Greece)
<papmari@gmail.com>

Weather charts in the popular media constitute a specific field of semiosis, meaning that they allow procedures of production and transfer of information by means of visual signs which, unlike other semiotic systems, are not firm and standard. The article deals with the ways 9 year old children interpret visual signs appearing on a website for weather predictions. The hypothesis of the research was that in order to interpret these visual signs correctly, the children have to reveal the semiotic system they are part of and then, discover the semiotic principles behind the formation of every sign or group of signs. As visual signs appearing at weather charts may be hyp-icons, indexes or symbols – regarding the relation they have to their dynamic objects –, the children's correct sign interpretation has to be based on the resemblance, the causality or contiguity and the symbolic value of the signs, correspondingly. Visual language is not always transparent and universally understood; therefore, children should be trained into it at school as part of the development of their general visual literacy.

Keywords: weather charts, visual signs, children, visual literacy

1. Children as sign makers

Our world is full of signs, which are constantly formed and re-formed over time and place, in order to fulfill their makers’ specific social needs; subsequently, signs are constantly in a process of re-construction and their meaning can only be understood within a system and through its social use (Bakhtine, 1977, p. 30).

In our everyday communication, we are all sign makers, as we combine signs that can create in our interlocutor’s mind the interpretations that we wish him/her to produce in order to understand what we really mean (Deledalle, 1979, p. 117).

Symbolic thought is developed in children from a very early age. Piaget points out that, by their second year, children are able to represent things. Objects, facts or even cognitive structures are transformed into signs (Piaget, 1967, 1976, p. 133-134). Children’s symbolic competence is created as they enter the social environment; this competence is dynamic, and is developed and extended throughout their lives. While playing, children use language and objects to convey meanings, converting, by this process, concrete objects of their reality into signs (Kress, 1997; Kress & Leeuwen, 1996, p. 7-11). This meaning making process, based on their symbolic competence, entails a process of understanding and construction of signs.

1.1. Visual signs

In our “visually oriented age” (Lowe 2000: 1), a great amount of information is transmitted by virtue of visual signs. Visual language, contrary to common belief, is not easier than language (Lowe, 2000, p. 1) nor transparent and universally understood (Kress & Leeuwen, 1996, p. 3). A special kind of literacy is needed for the appropriation of visually transmitted information, meaning visual literacy, which is defined as the “ability to construct meaning form visual images” (Giorgis u. a., 1999, p. 146).
By 3 years of age, most children can use visual symbols to denote things (Bamford, 2003, p. 2), but in order for them to be visually literate in this visual world, they need to further develop skills to interpret visually transmitted information and to produce visual messages.

Weather charts – like all maps – constitute a specific field of semiosis, meaning that they allow procedures of production and transfer of information by means of visual signs. Visual signs used in weather charts are not firm and standard, unlike signs in other semiotic systems (e.g. road signalization or meteorological maps) where visual signs have a conventional status and whose interpretation is based on strict prescriptions. They can only be interpreted, if one already knows the signs used in each and every weather prediction – a task out of reach – or if their semiotic principles are clear to their users.

2. Methodology

2.1. Hypothesis & material of the research

The aim of this research was to reveal, which methods 9 year-old children use to interpret the meaning of visual signs used in weather report predictions. The research material consisted of visual signs that appear on the site: www.meteo.gr (last access on July 10, 2009.) Prior to the research, the children had no access to the site, so they weren’t familiar with this particular kind of semiosis. Visual signs used in the site were classified according to the second trichotomy of the Peircian semiotic theory, meaning that each sign was classified in relation to its dynamic object as an icon, an index or a symbol (Peirce, 1978, p. 138-166).

![Figure 1: Classification of the visual signs used for weather forecasting by: www.meteo.gr](www.meteo.gr)
Although all signs are visual, meaning that they appear in a two-dimensional space and are captured by vision, iconicity is not a property commonly shared by all the signs. In fact, only three signs can properly be characterised as icons (and especially images) bearing relations of similarity to their objects (the signs for: thunder showers, cloudy weather, wind force 9+ Beaufort over sea areas; the sign for snow showers shares common properties with its object which, although not obvious at first glance, can appear when a snow flake is seen through a microscope). Four signs share an indexical ground, two of them being pure indexes (the signs showing the direction of the wind) and two of them having indexical as well as iconic properties (the signs indicating the speed of the wind) – although the first is the prevailing property for an accurate interpretation. The double quality of these signs permits interpretations based on physical resemblance – similarity – than indexical properties (in this case the causality principle). Finally, four of the signs were classified as symbols, although only one is a pure symbol (the temperature sign). The other three signs (the night and day time signs and the sign for wind force from 0 to 2 Beaufort over sea areas) share arbitrary – conventional – as well as iconic properties, but these are not sufficient for an accurate interpretation of the signs.

In order to interpret the meaning of every sign the children had either to “transfer” general knowledge about visual signs used in weather forecasting or to “guess” the meaning of each sign by some kind of “technique”.

The hypothesis of the research was that in order to interpret these visual signs correctly, children have to reveal the semiotic system they are part of and then, discover the semiotic principles behind the formation of every sign or group of signs. In the case of hypo-icons (images), the children can guess their meaning by the similarity between the sign and its object, meaning they had to depend on the sign’s appearance (shape, color etc). In order to interpret indexes correctly, the children have to find out the relation (either of contiguity or of causality) between the sign-vehicle and its object. Thus, the interpretation of indexes was based on the discovery of this principle, rather than on the knowledge of each separate sign. Finally, the children could only interpret symbols on the basis of prior knowledge. As this knowledge is acquired by social use, the interpretation of symbols evolves over time and with social interaction. Finally, when signs are mixed – which is the case for many signs – , children have to reveal their primary function and then take any other semiotic principle into consideration. Not having discovered the primary function, a false interpretation may occur.

2.2. Participants

Nine boys and seven girls, all 4th grade students, participated in the research, which took place in February and March 2006. Their school is located in a semi rural region, near the city of Volos (a medium sized city in Central Greece).

2.3. Method

The research presented here is part of a wider project, which comprised six class activities and a personal interview with each child.

The results of this part are the conclusions arrived at from the first two activities which aimed at investigating the children’s knowledge or accurate guesses of the meaning of visual signs used in weather prediction.

The personal interview, conducted with each child separately, aimed at investigating the techniques used by the children to reveal the meaning of the visual signs.
During the first activity the children were given the list of the visual signs presented above and were asked to write down each sign’s meaning in a two column table (a blue and a red one). In the cases in which they were sure about their answers, these were to be written down in the blue column, if the children thought they could guess an interpretation by some kind of “clue”, they were asked to use the red column. Having completed the table, the children were separately asked, by two interviewers, about the way they had revealed the meaning of each sign.

The second activity consisted of finding correspondences. The children were given both the visual signs and their verbal interpretation, and were asked to find which sign stands for each meaning.

![Figure 2. Correspondences between the verbal and the visual (2nd activity)](image)

3. Results

All students discovered easily the semiotic system the signs were part of, through being exposed to weather forecasts daily. Nevertheless, while writing down the meaning of each sign – during the first activity – they weren’t always consistent in their answers, as in the case of the indexes, which were interpreted, by a small number of children, as belonging to the road sign system.

The results of the first activity indicate that most children either knew or correctly guessed all images and the temperature symbol. Furthermore, almost half of them interpreted correctly the sign for wind speed 9+ Beaufort over terrestrial areas (which can also be interpreted by virtue of its appearance). All other signs were misinterpreted by the children.
Results were radically improved in the second activity where the children’s answers were more guided. Wrong answers were given only for the sign for wind speed 9+ Beaufort over sea areas.

![Figure 3](image1.png)

Figure 3. Numerical data from the 1st activity. Visual signs known or guessed by the children

![Figure 4](image2.png)

Figure 4. Numerical data from the 1st and the 2nd activity
The children mainly used descriptions when interpreting signs. This happened because – as they indicated while being interviewed – the main technique they used to understand the meaning of every sign was its appearance. This technique was used for almost all signs (the snow showers and the temperature sign were not included) by the majority of the children (see figure 3). This led to almost correct answers as far as images were concerned (e.g. “clouds” as the sign of cloudy weather; “thunderstorm”, “bad weather”, “rain and thunderstorm” for the sign of thunder showers; “waves”, “gale”, “rough seas” for the sign of wind speed 9+ Beaufort over sea areas), but inappropriate answers were given for almost all signs with indexical value, either pure indexes or iconic indexes (e.g. the northerly winds sign was interpreted as “an arrow”, “a sign to go”, “a sign for direction” and “south wind”; the sign for wind speed 9+ Beaufort over sea areas was often interpreted as “a broken tree”, “a palm tree”, “a tree on an island beach” etc).

Almost all the children failed to reveal the role of causality in the formation of the pure indexes, namely that this sign represents visually the action of the wind over an object (in that case, over an arrow). Subsequently, the arrow shows the Northerly winds or the South Easterly winds because it moves in the direction of the wind. Even when the children realized that the two signs are used to demonstrate wind direction, they thought that these showed the exact opposite direction, providing visual (it “points to”) instead of indexical value (it “is pushed by the wind”) to the signs.

The signs with symbolic value were also misinterpreted by the children while using the same technique (e.g. the night hour sign was interpreted as “a clock and a moon”, “time is changing at night”, “night” etc). Most children were simply describing what they saw.

Additionally, six out of twelve signs were recognized by many children, because they have seen similar signs in television weather report predictions (the signs for snow and thundery showers, the sign for strong winds over terrestrial areas, the night hour and the temperature sign). Although the system was not exactly the same, they were able to efficiently ‘transfer’ their knowledge in most cases. School knowledge was correctly used only for the temperature symbol. On the contrary, this “technique” led to misunderstandings as far as the sign for calm seas was concerned (e.g. “water level”, “water evaporation”, “glass of water” etc). An experiment conducted in the school class on the previous day, was the cause of this misinterpretation.

The presence of mixed signs is quite usual in weather report predictions. Considering the classification of the signs used in the research (see figure 1), the results are very good even for images with conventional value – as in the case for snow showers. Interpretation of indexes with iconic value, like the signs for wind speed over terrestrial areas signs (see figure 3), were more easily understood than pure indexes. As, in some cases, these signs were approached comparatively to each other, the more obvious iconicity of the sign for strong winds over terrestrial areas guided the interpretation of the other similar sign. In the case of symbols – like the night and day hour sign – the iconic elements (color and figures) didn’t facilitate the sign’s interpretation. Major misinterpretations also occurred for the sign of the calm seas, where the iconic character wasn’t sufficiently obvious to the children.
5. Conclusion

In order to interpret correctly visual signs used in weather maps, the children have to reveal the semiotic system these signs belong to and discover the semiotic relation that each sign has with its dynamic object, whether a hypo-icon, an index or a symbol. Following that, the children have to interpret hypo-icons based on the resemblance to their dynamic objects and the indexes by revealing the causal connection to their objects. Symbols can be interpreted only if the children already know the arbitrary relation between the sign’s signifier and signified.

In the research, most hypo-icons were correctly identified because the main technique used by the majority of the children for the interpretation of all signs was based on the signs’ appearance. Guesses based on similarity to the depicted phenomenon were appropriate for the interpretation of images, but as this technique was over-generalized in the interpretation of other kinds of signs, major misinterpretations occurred. The children failed to realize the causal relation by virtue of which the indexes represent their objects, and inappropriate interpretations based on the signs’ appearance were given. Alike were the results for the interpretation of the symbols – only the pure symbol (the temperature sign) excluded.

Although interpretation based on resemblance between the sign and its object is not a sufficient technique for an accurate interpretation of every sign, it is the main technique used by the children as they try to convey the meaning of visual signs. Differentiated techniques should be proposed to the children, according to the relation that every sign has with its object, in order for them to avoid misinterpretations. Provided that a guided approach of some kind is needed, visual signs’ recognition – as part of visual literacy – should be incorporated into the school curriculum.

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7. References