ARTICLE

Staring at the page: The functions of gaze in a young child's interpretation of symbolic forms

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Abstract This article argues that young children are capable of complex abstract reasoning which is rooted in their physical and emotional engagement with the world. It suggests that even apparently commonplace representative objects are not transparent, and children are faced with a major interpretative problem when becoming familiar with symbolic images and objects. It also suggests that young children are motivated by an expectation of significance about the symbolic systems they encounter, including systems of low modality like writing. Their interpretative activity is mediated through physical and bodily resources, of which gaze is of major significance to sighted children when reasoning about visual, spatial modes of symbolic representation. The article presents a micro-semiotic, multimodal analysis of a small section of video film in which a two year old child is engaged, with her father, in drawing and marking: representing and interpreting graphic signs. Three functions of gaze are identified during this activity: analytic, interpersonal and expressive. The systematic and motivated coordination of these types of gaze with other bodily modes, including language, is shown. The article concludes that the boundaries between young children's bodily and cognitive activity can be seen to be flexible, making many of their processes of reasoning and interpretation about systems of symbolic representation accessible to description.

Keywords children; gaze; interpretation; multimodality; symbolic representation

Introduction

A considerable body of evidence attests to the abilities of very young children to reason logically, in contradiction of the Piagetian account, which suggests that reasoning of a deductive and abstract nature does not appear until much later. Not only that, but much of this evidence (Bruner,

1990; Deloache and Brown 1987; Donaldson 1978; Girotto and Light 1992; Harris, 1990; Siegal 1991) demonstrates the way in which abstract reasoning is rooted in seemingly commonplace social experiences and discourse. Such experiences include the manipulation of ordinary material objects and the engagement in day-to-day physical actions; and both this activity and its concomitant discourse involve an affective dimension in which feelings about what is going on and with whom play a significant part. In other words, all the minutiae of a young child's world, and their physical and emotional engagement with it, have a central role in their construction of understandings about logical relationships between people, objects and events. To put it another way, it is this social and material world that provides the semiotic resources (see also Kress, 1997; Van Leeuwen, 1999) from which children derive the tools for abstract reasoning (see Vygotsky, 1978; Wertsch, 1991).

The task that arguably involves the highest levels of such reasoning is that of interpreting the different systems of symbolic representation used in the immediate world around them, of which writing systems are perhaps the most complex. This article is particularly concerned with the making and interpreting of visual signs: the drawing and marking that are a precursor to the representation of meaning through written signs. This is seen as a hermeneutic process from the outset, and one in which children use all the semiotic 'tools' at their disposal. And whilst this is in one sense self-evidently a cognitive process, it is mediated through physical and bodily means such as language and gesture and, of particular concern where visual signs are concerned, gaze. These physical and bodily actions are visible indicators of the course of abstract reasoning used whilst engaging with the difficult business of finding out about how a system of symbolic representation works. The examples to be discussed in this article are two sections of video film featuring a two-year-old girl making a mother's day card with her father. A micro, multimodal analysis of their discourse is used in which the child's physical modes of mediating meaning are charted. From the description of her coordinated use of, in particular, language, gesture, gaze and action, the processes of her reasoning start to emerge and become accessible to further interpretative analysis. The examples will be used to discuss her interpretation and generation of visual signs and, in particular, the different functions of gaze that she deploys as part of this process.

Representing and resembling

For children born in the late 20th or early 21st centuries, there is a plurality of technologies by which meanings are signified. In the example already

cited, and discussed in detail later in this article, the little girl is engaged in the matter of visually representing a cat by means of the common technology of applying a felt tip pen to a piece of paper. However, within her particular cultural and semiotic environment, a host of other modes and forms of signifying 'cat' are likely to be available: toys, three-dimensional representations, drawings and paintings, printed representations and illustrations, photographs, visual and moving images, computer graphics, recorded sound, musical and sound images, and so on. Within such a group of signs, there are also different relationships of representation, depending on the degree to which the original object acts as the primary reference point for the representation (that *looks*, *sounds* like a cat); or whether the relationship rests on the existence of similarity between a quality (see Foucault, 1983), or a number of qualities of the object and its representation (that is *furry* like a cat). Where images and objects are produced specifically with young children in mind, there is likely to be an emphasis by the producer on recognition in the relationship between represented and real; an emphasis on having a strong relationship of similarity between a primary reference point object and its representation; simplifying signification, the argument might go, by making the representation realistic, and the signified familiar, in order to make it easier for a child to *see* what is meant.

However, as Eco (1979) points out, 'there are certain perplexities surrounding the notion of "similarity to objects"' (p. 193). The relationship of similarity is a highly variable one, with different constituent features of an object foregrounded in the relationship, depending on the function, mode and form of the image. Recognition is not just concerned with visual similarities. In Hanna and Barbera's animated 'Tom and Jerry' cartoons, for example, whilst Tom does have some visually recognisable cat-like features, it is the cat's instinct to hunt mice which is of interest to the makers of the animation; what is significant for the fast frame to frame movement of the form, is the defining need Tom has to be perpetually engaged in some kind of war with Jerry (see Kenner, 1994). A soft toy representing a cat might be considered to have a fairly strong relationship of visual likeness to a 'real' cat, but the congruent features with something designed as a child's cuddly toy are attributes like softness, solidity and malleability. Knowing what cats do and what they feel like is as significant in the interpretation of these signs as knowing what they look like.

Recognizing an image or an object as being like, in the sense of an accurate representation of, 'the real thing', is not a simple matter of visual perception. As Goodman (1976) suggests, realistic, 'like' representation, cannot be defined as some kind of close resemblance to reality; rather it is

in itself a style of representation that is determined by the practice of a given culture at a given time. Realism is a product of representational practice that is designed to generate resemblance and recognition. Similitude is not therefore a matter of any fixed and given relationship between represented and real, but something socially and technically constructed. The systems used for creating images and artefacts for young children that are recognizable representations of the real, are likewise socially and culturally determined. Kress and Van Leeuwen (1996) discuss similitude in terms of its modality: the means by which sign makers express degrees of truth and falsehood, and fact and fiction. In the case of visual recognition, 'modality rests on culturally and historically determined standards of what is real and what is not, and not on the objective correspondence of the visual image to a reality defined in some ways independently of it' (p. 168). Modality values can be high or low, depending on the extent to which the maker needs to achieve an effect of realism or abstraction. These values are not straightforward: different configurations of modality can be combined in ways that reflect the complexity of these relationships of similitude. In the examples already cited, there are complex configurations. In the case of Tom, modality is fairly high in his possession of cat like features (ears, whiskers, paws, body shape), colour, the fact of movement and a tendency to chase mice; but it is low in his being two-dimensional, in being represented as able to move and manipulate objects in a human as well as a feline manner, and in being possessed of a perpetual immortality in the face of appalling disasters. With a soft toy, modality might be high in its cat-like features, in its being three-dimensional and in its soft and furry haptic qualities; but low in its lack of movement or interest in mice. In each case, these configurations of modality are subject to social agreement and determined by the form and function of the image and object.

The point has already been made that toys, book illustrations and other artefacts for young children tend to be designed and made predominately using 'realistic' systems of representation; the thinking being that this makes meaning more accessible. However, herein lies a paradox. In systems of visual and plastic representation, this achievement of transparency, the impression of 'simple' physical reality, requires a complex interpretative act on the part of artists, designers and makers, by which generic features of the object, salient to their meaning, are represented through use of material and physical techniques. This activity involves a high level of spatial thought (Gardner, 1993) and physical skill: it might require geometric skills for composition and perspective in two or three dimensions (Berger, 1972; Kress and Van Leeuwen, 1996; Plumb, 1961); or the systematic selection of colour to structure visual meaning (Kristeva, 1980); or the manipulation

of matter to create form. Simplicity, in other words, is the result of a process of social and technical construction that to be understood requires, in itself, not just an act of recognition, but an act of interpretation: distinguishing a particular set of what Bryson (1983) describes as 'codes of recognition' (p. 43).

What young children are presented with, in the course of becoming familiar with the symbolic images and objects in their physical and cultural environment, is a major interpretative problem requiring the highest levels of reasoning: a hermeneutic challenge in fact, which involves not the construal of various discrete meanings, but of systems of meaning, and the ways and means by which they connect to human experience. In other words, a process that involves not the revelation of some kind of 'original' sense, but something more akin to what Gadamer (1989) describes as 'ideative reconstruction . . . in *thoughtful mediation with contemporary life*' (pp. 168–9, original emphasis). Gadamer also suggests that such a reconstruction involves not just a concern with content, but also, as importantly, with physical production, since it is through their material presence that objects, images, symbols and sounds signify, pointing away from themselves towards those things in the world that they represent. These systems of representing meanings, are social 'documents', 'by means of which the members of a community recognise one another' (p. 72). For young children, learning about these systems involves engaging directly with the process of production in the course of their day-to-day affairs.

Kress (1997, 2000), Labbo (1996) and Rowe (1994) describe different ways in which very young children create symbolic objects and representations out of resources available to them in their immediate environment: a drawing of writing; a car made from household objects; lettered representations of a name; graphic jokes on a computer screen; presents and messages swiftly constructed with paper, glue and scissors. In doing this they are engaged in interpretative activity: exploring and investigating systems of representation through their own productions. A common feature of all this activity is its transience, its existence for the moment. Although each object created is complete as it stands, it is also, significantly, a provisional, hypothetical stage in the ongoing hermeneutic process in which the children are involved. Kress (1997) and Ferreiro and Teberosky (1982) have documented this operation of generating and working on hypotheses through examining the processes by which children learn to write their name; and, extrapolating from this, start to learn about the workings of systems of written representation. Here there is no 'simplification' of the system; indeed it is a system with very low levels of modality; and yet the young children whose activity they describe are able

to logically and creatively reason out relevant 'codes of recognition' for themselves. Abstract questions about shape, size, spatial orientation and positioning, quantity and sequence of graphic elements concern them at this stage and are the basis of their hypothesizing. Production and analysis operate in tandem: Kress, observing his daughter engaged in this process, notes, 'Each new way of writing represents the insights she gained from her preceding analysis, therefore a change in her knowledge' (pp. 66–7).

All this 'symbolic action', as Thompson (1990) terms it, is characterized by an expectation of significance about the semiotic objects encountered. Children are introduced to them, one way or another, as having a social or affective purpose: the cartoon makes you laugh; the soft toy comforts; writing can entertain and inform. Moreover, this does not happen randomly. Symbolic meanings are systematic and logical, albeit differing in the types of system and logic in operation. A soft toy might be considered as having a relatively transparent system involving a relatively small number of attributes that make it highly recognizable as a comfort object in certain cultures. A graphic system like writing on the other hand, with its much lower modality can be seen as involving a much greater level of interpretative activity. In both cases however, children can recognize that symbolic objects not only represent things about the world per se, but represent these things in systematic ways. Ferreiro describes how this process operates when children engage with written graphic forms:

> Children pose deep questions to themselves. Their problems are not solved when they succeed in meaningfully identifying a letter or string of letters, because they try to understand not only these elements or the results but also, and above all, the nature of the system. (Ferreiro, 1984: 172)

Seeing that representation is systematic in this way is an insight that is prior to, and motivates hermeneutic activity; children are impelled to find out how symbolic systems mean because this enables them to understand what they mean. Through all their practical and material engagement with making and representing things, they are participating in creating meanings at the very highest levels of abstraction.

Space, absence and mark

Levels

Three levels of evidence are drawn on in the course of this semiotic analysis (see Thompson, 1990): ethnographic evidence derived from personal knowledge of the participants, and elicitation of further necessary evidence and information from Anna's father at stages throughout the research;

micro, multimodal description (see Hodge and Kress, 1988; Manning 1987) of the means by which Anna mediates and generates meanings, and the social interaction of which this is a part; and hermeneutic explanation based on 'thick description' (Geertz, 1983), drawing on both the other levels. However, the boundaries between these three levels of evidence and explanation are flexible, providing opportunities for comparison, confirmation and reflection.

Participants and setting

The participants in the video text previously referred to are Anna, 23-months-old at the time and her father Rob. Rob is the film-maker with Anna as the main actor and her actions as the prime focus of the camera. He makes only partial appearances on camera, often with just sections of his profile and hands and arms evident when he is sitting next to Anna and engaging in activity with her. The video text arose out of both Rob's personal and professional roles: as a father interested in recording his daughter's development, but also as an educational professional with a particular interest in the very early stages of literacy. The filming took place early on a weekend morning, before the rest of the family were up, with the activity all taking place on and around the table in the kitchen. Rob habitually spent this time with his daughter, which is likely to have contributed to the relaxed and comfortable manner of their interaction around the text. It was also the case that Anna accepted the video camera without being directly curious since Rob had used it with her on a number of previous occasions. Anna's mother Mary, as the intended recipient of the card, is implied as a participant, although she is not physically present at the time of its production.

The card

The mothers' day card (Figure 1) started as an A2 sheet of blank orange cartridge paper. This was folded in two by Rob to make a large 'card' and a pot of felt tip pens placed on the table nearby. Immediately prior to the Scene to be discussed, Anna had already made a small black zigzag about two-thirds of the way down on the right-hand side of the page: this she designated as a 'drawing'. A second zigzag is done in red felt tip equidistant between the first mark and the bottom of the page: Anna designates this area of the page as the space for 'drawing' and the rest of the page as the space for 'cats'. She then turns the card over and looks at the blank sheet on the other side, turns it back to refer again to the marked page and then returns to the blank sheet and makes another small, red zigzag in an equivalent position to the mark on the other side. Finally, she makes another

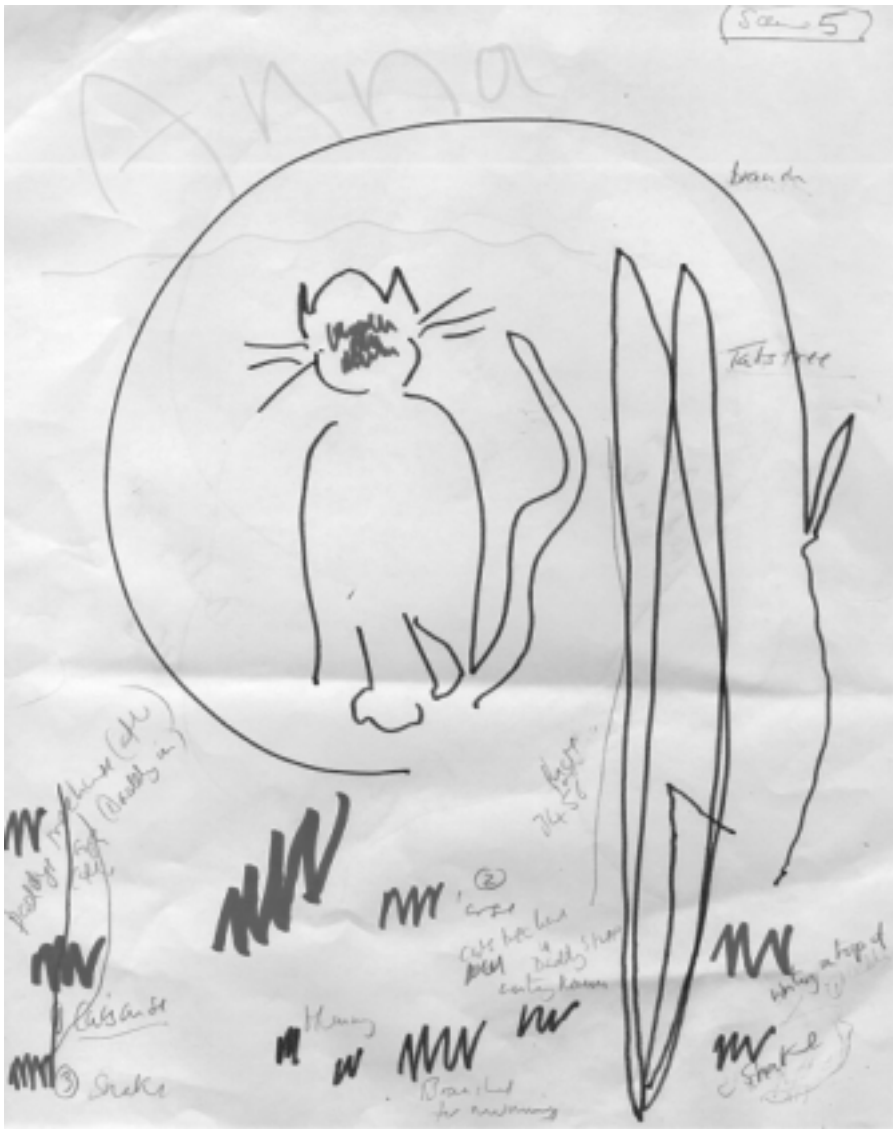

Figure 1 **The Mothers' Day card**

small, red zigzag on the bottom left-hand side of the page, which she designates as a cat.

Framing

Two levels of framing are used in this section of the analysis, grounded in the principles of organization negotiated between Rob and Anna around

the book (see Goffman, 1986). The broader level of framing is that of 'Scene', which is characterized by the particular topic developed in the course of transforming the sheet of paper into a card. So, for example, Scene 1 revolves around the physical activity of folding the paper and organizing the felt tip pens, and Scene 2 around the representation of cats. Within the Scene, a more micro level of framing, that of 'Episode', is used, with each Episode covering one main, central semiotic event. In the Scene to be considered, Scene 2, Episodes 2 and 3 are discussed, in which the central semiotic events are, respectively, *Rob and Anna's drawing of cats* and *Anna's addition of features to the face of Rob's cat*. Episode 2 lasts for 18 seconds and Episode 3 for 20.

Multimodal description

This part of the semiotic analysis involves description of the physical, bodily means of mediation used by Anna in the course of Episodes 2 and 3, represented in Tables 1 and 2 respectively. The descriptive categories reflect those mediating strategies consistently deployed by Anna in her interaction with Rob during her interpretative activity. In other words, the categories were derived from a close interrogation of the video text itself. The set of descriptive categories used are: *language*, *vocalization*, *gesture*, *gaze* and *action*. Anna is the agent of all activity described in the tables, except where Rob is specifically identified. The marks made on the paper by Anna, which constitute the evolving mothers' day card, are described as they arise under the category heading, *semiotic object*.

Hermeneutic analysis

This stage involves a micro-level interpretative analysis derived from the multimodal description, but also incorporating and drawing on the personal, social and cultural insights provided by the ethnographic information. As with any exegetic process, the view of the interpreter is part of the interpretation: in this case, an adult's view of what motivates the thought and actions of a very young child who is still developing as a language user. Paradoxically, the very fact that Anna is too young to have access to the full range of linguistic resources, and yet has a wide range of interpretative strategies available to her, opens up most interesting questions about whether such strategies can be 'seen' and described. By incorporating the full range of bodily modes of mediating and generating meaning that Anna uses into the description and interpretation, a much fuller picture starts to emerge. A reliance on linguistic description alone would not only limit the picture of the process, it would also reinforce a view of the child as interpretatively limited, by allowing its description to be dominated by the one mode which is not yet fully available to her.

Table 1 **Episode 2**

Local Setting
Anna is seated at the table with the card in front of her and a felt tip in one hand. She has just completed a representation of a cat. Rob is looking at it with a felt tip at the ready in his right hand to do his drawing.

Language		*Vocalization*	*Gesture*	*Gaze*	*Action*
EPISODE 2 (18 secs)					
Anna	I drawing			eyes on Rob's pen	Rob starts to draw head
				eyes on own drawing	Anna starts drawing in bottom left with up and down stroke
				eye movement up the page to look at Rob's drawing eyes on own drawing	Rob draws body and tail with quick strokes Anna's up and down stroke becomes more vigorous
Anna	a'ts tat		points to own picture, holds finger on page	looks at Rob	
Rob	yes there's Anna's cat and there's daddy's cat		Rob points to his cat with felt tip	Anna looks at his cat	
	oh/forgotten the whiskers	[əʊ] 0.5 secs		looks at Rob drawing whiskers	Rob draws cat's whiskers
Rob	I've forgotten the whiskers.	[uːʰʌ + smile] 1 sec			
Rob	Daddy's whiskers				

Drawing cats

At the end of the previous Episode in this Scene, Rob and Anna have reached an agreement that they are going to make drawings of a cat. Anna has already moved her gaze to the bottom left of the page, within the designated area of space for cats, in preparation for this. She then asserts the nature of her intended activity as, 'I drawing', indicating by this that the action she is about to undertake has a representational significance prior to any material outcome; to draw, in other words, is a meaningful thing in itself. Before starting, she slides her gaze up the page, without moving her head significantly, to check what Rob is doing. As soon as he starts, she moves her gaze back to the bottom left of the page and embarks on her own drawing. Anna continues to use the same two visual resources to represent her cat, the space of the page and a zigzag mark made by a felt tip pen. As mentioned above, she had already organized the space by designating the left hand side of the page as the section on which 'cat' was to be represented and had placed her first 'cat' on the bottom of this part of the page; she places the second 'cat' mark near the first, filling up the space on that section of the page. Her marking of the second zigzag starts with a bigger up-and-down action than for the first cat, but the length of each stroke is still fairly consistent in size. However after five or six strokes, Anna's eyes slide up the page again to observe Rob drawing his cat's body and tail with a quick, flowing action, extending the body and tail of the cat down and across the page; her pen strokes now become more extended and vigorous, in parallel with Rob's drawing action, and her gaze appears to move back from the page, as if to watch her own process of representation more objectively. The alteration in her physical action produces a different type of mark: longer, with less of a zigzag, and bolder as a result of the greater pressure on the pen. She then lifts her gaze from the page and turns it to Rob, signalling a return to an interpersonal mode; still in this mode, she locates the subject of her interest by making a finger gesture on the mark she has just made and gives it identity by her comment, 'ats cat'.

There is no evidence that Anna sees the necessity of producing a 'drawing' whose purpose is to represent the cat by generating a resemblance between an actual cat and the mark representing it. It is at the level of the *process* of representation where Anna looks for the means to ascribe a representational character to her mark. Although it does not resemble a cat in the same way as Rob's drawing does, like Rob, Anna is using those codes that are familiar and available to her to represent a cat. The performative 'I drawing' gives representational significance to the mark prior to its making: its placing in the 'cat' space of the page identifies it as a particular type of

mark. Anna also incorporates something of the individual style of Rob's marking action into her own, such that the nature of the action has representational significance: drawing in a particular cat-like way will represent a particular kind of cat.

The page now has three different graphic representations of 'cat'. Rob adds a further distinction according to who drew which cat: 'there's Anna's cat and there's Daddy's cat'. He then draws attention to the fact that he has omitted the whiskers from his cat. Anna watches, responding only with supportive vocalizations, while Rob transforms the cat's face by adding the missing whiskers in the form of three lines sticking out horizontally from either side of the outline shape of the face: 'Daddy's whiskers'. Her gaze continues to be held on the representation of the face throughout this process, except for a brief lift of her head as she makes the vocalizations.

The cat's face, which Anna has continued to study, is a space contained within the single blue felt tip outline representing a cat's head, now with the addition of a set of whiskers. Rob's stress on something 'forgotten', on a missing feature, sets up a new expectation for Anna; other things may also be missing. The area within the head outline now signifies a space which might be lacking certain elements; an interpretative problem involving 'ideative reconstruction' and representational codes; in other words, there are reasoned decisions to be made about which features of cats' faces might reasonably be expected to be part of a drawing like this, and which not. Anna's experience of what real cats' faces are like is tempered with questions of modality in the light of her knowledge of which parts of their faces are usually represented when someone draws a cat for her; not only that, but how physical action and material marks can be used to represent all this. These complex questions about how ordinary, everyday things can be abstractly represented confront Anna as she now moves into the business of 'completing' the representation of the cat's face.

Tools for the job

There is a clear distinction between the visual, material and social resources which Anna has available to her in the course of creating a mothers' day card: card, pens, paper, space, marks, memories of cats real and represented; and the physical, bodily tools which she deploys to mediate the meanings which she generates. These social and material resources that Anna has available to her to help her represent her meanings are mediated through her use of language, vocalization, gesture, gaze and action during her social interaction with Rob; in other words, the creation of symbolic meaning is a highly social affair. It is also a highly multimodal process as the analysis shows and language is just one way in which Anna mediates meaning. Not

only that, but as well as language having multiple functions, the same can also be said for the other modes, and it is this complexity of the structure of mode that enables Anna to interpret and generate the meanings that she does. An apparently transparent mode such as gaze, for example, can be shown to have two quite distinct, but multiply constituted mediating functions.

Analytic gaze

Gaze, for a sighted child, is tool of major significance in the process of reasoning involved in the interpretation of visual–spatial modes of symbolic representation. Widdicombe (1998), in an interview with the blind photographer John Dugdale, quotes him as making a distinction between vision and eyesight. Dugdale describes his vision as unimpaired even though his 'mechanical sight' (p. 12) is defective; in other words, what is seen is not just the result of the physical process of looking. Such a distinction was also made by the architect Le Corbusier (in Gardner, 1993) who suggests that the view of an object acts only as 'a shutter release' for knowledge of it acquired through sensory, tactile, material, spatial and social experience of its properties; Bryson (1983) too, distinguishes between sensations which are not only 'retinal, but may involve the most private recesses of sensibility' (p. 41). This does not mean however, that these are distinct processes, 'one optical, the other interpretative' (Hanson 1969: 9); as Hanson goes on to point out, 'one does not first soak up an optical pattern and then clamp an interpretation on it'. Movement of gaze when engaging with forms of symbolic representation is motivated by the prior interest of the looker in the course of the interpretative process; 'retinal activity' is informed by the vicissitudes of analytic interest in the visual and spatial forms involved. While Anna is drawing her cat, her gaze is initially focused exclusively on the construction of her own representative form; in the course of this, her eyes, but not her head, move in such a way as to simultaneously take in the drawing action that Rob is using; her gaze then returns to her own drawing and the quality of her marking action changes. The degree of retinal movement is small, given the fixed position of her head, but nevertheless significant; the movement towards is informed by her interest in the quality of Rob's drawing action; the return movement brings this quality back into her own work; the nature of the movement enables all this to take place without Anna shifting the focus of concentration away from what she is doing.

Gaze, in this respect, is the physical means of mediating the visual and spatial analysis that is central to the interpretation and construction of the systems of meaning, the 'codes of recognition' that are involved in symbolic

representation. Jay (1988) makes a distinction between gaze and glance, with the length of the look being significant, although there is not a necessary connection between length of gaze and complexity of perceptual judgements: Anna's shift of gaze to look at Rob drawing was a brief, small movement of the eyes, but one which nevertheless resulted in a transformation in the quality of her action and the resulting mark on the page. What is significant here is that the manner and quality of gaze is informed by the nature of the analytic task involved. In spite of the seemingly minimal number of resources with which Anna is operating, a number of very complex semiotic operations are going on involving sophisticated visual reasoning processes.

In this case, these operations centre initially on an analysis of space: the empty page needs to be organized so that the space can in itself carry meaning. For Anna to be able to look at space in this way will require her to have had different social experiences involving what Gardner (1993) describes as 'orientating oneself in various locales, ranging from rooms to oceans' (p. 176): the table in her kitchen on which she is making the card, for example, is a space within a space for carrying out certain agreed activities: cooking, eating, working and playing of certain kinds; the rules for the organization of this space are negotiated and agreed by her family. The insight that space per se needs organizing in order to be meaningful is therefore one that exists prior to the consideration of any particular area of space: it will inform how the page is looked at and seen. In Anna's assigning of a representative function to sections of the space on the paper ('drawing there', 'cat there') she has used her experience of how space is used and organized to set up a system which will enable her to make visual connections between the marks to be made by locating them in a particular position ('this a drawing mark because I have put it in the drawing space', 'this is a cat mark because I have put it in the cat space'). The consistent use of visually congruent marks, each one a basic zigzag form, also makes this a system of considerable economy and delicacy; the structure of the mark remains constant whilst its representative significance is assigned by its location. Tufte's comment about minimal distinctions in the representation of visual information could be seen to apply here: 'Minimal distinctions reduce visual clutter. Small contrasts work to enrich the overall visual signal by increasing the number of distinctions that can be made within a single image' (Tufte, 1997: 77).

In this case, the system of contrast is a binary one, between mark and identified section of space. A further contrast is introduced through the change of marking action when Anna incorporates some of the quality of Rob's marking action into her own: the size of the zigzag increases, but the

structure of the mark remains the same, although qualified by additional 'Rob's cat' features. What she has constructed here is a simple visual grammar, in the sense used by Kress and Van Leeuwen (1996): the systematic organization and combination of visual features to generate meaning.

Interpersonal gaze

The process that has just been discussed, is a process of visual thinking (Arnheim, 1969), with gaze having an analytic, as distinct from an interpersonal, function. Gaze, in its interpersonal role, is nevertheless as significant a part of the total hermeneutic activity in which Anna is engaged, functioning during social interaction in conjunction and collaboration with other physical modes of mediating meaning. Kendon (1967, 1990) has pointed out that remarkably little research has been carried out about the role of facial behaviour during social interaction and identifies three principal functions of gaze: monitoring, regulating and indicating planning. When monitoring, gaze is used to check on the response and attention of the interactant; in its regulatory capacity, gaze can signal significant points within a section of discourse: sustained gaze towards the end of such an utterance, for example, can signal that the speaker is about to finish talking. Streek (1993) describes the way in which gaze is also used in a regulatory manner by being directed at a particular gesture which the speaker is using. Where gaze is used to indicate planning, it is the removal of gaze that is significant: looking away can signal ordering of thoughts before embarking on an extended utterance, or can register uncertainty of some kind. Kendon also talks of gaze as having an expressive function, which demonstrates feelings or attitudes. Arguably, there is not always a clear boundary between gaze in its analytic, interpersonal and expressive functions. When Anna first moves her gaze to look at Rob drawing, she is monitoring his activity, looking at the movement of his hands to check what he is doing; her purpose at the outset is most likely an affective one: she spent much of the first Scene trying to cajole him into drawing the cat and wants to check that he is doing it. However, the function of her gaze shifts to the analytical as the manner of his drawing action strikes her as representatively interesting. After she has completed her cat drawing, her gaze returns to the interpersonal mode, looking directly at him to draw attention to her completed mark. She then focuses on what Rob is drawing as he adds the missing whiskers, but here sharing in what he is doing and vocalizing to indicate her interest. However, in addition to her affective and expressive purpose in looking at what her father is doing, her gaze is also functioning analytically as she watches Rob's transformation of the cat's face. This will become clear in the discussion of the following Episode below.

This does raise the question of the extent to which these functions of gaze can be seen to have an independent semiotic purpose during the interpretative process, as opposed to being simply co-expressive and reinforcing of other modes (see McNeil, 1992). At the least transparent end of the scale, in the case of those whose language is signed, facial expression plays a significant independent role in the grammar of the language itself (Sacks, 1991). Streek (1993) refers to the finely tuned collaboration of gaze and gesture as 'co-operating towards maximum use of symbolic resources' (p. 276). Weinberg and Tronick (1994) provide some useful evidence that gaze is one of the modes that infants use in systematic and motivated combinations in specific interactive contexts: gaze, voice, gestures and other behaviours were observed and separately coded during different interactions with their mothers. During these interactions, the modes were differentially combined in ways that related to particular events. This system enabled them to express different aspects of their needs simultaneously; for example, using a facial expression to express anger at the same time as signalling in other ways the desire to be picked up. The authors suggest that: 'we cannot view one expressive system as the primary index of emotions. Rather we must begin to evaluate the extent to which different expressive behaviours convey affective information on their own and, more importantly, in relation to one another' (Weinberg and Tronick, 1994: 1512). Alibali et al. (1997) and Iverson and Goldin-Meadow (1997) have also shown how children engaged in various problem-solving tasks are able to mediate different information through coordinated use of different modes. In the discussion of Episode 3 to follow, it will be seen that Anna is also able to coordinate the use of the analytic and interpersonal functions of gaze as she works on the 'completion' of the cat's face.

Eyes

Anna's visual interrogation of the cat's face continues throughout the process of Rob adding the 'missing' whiskers; the face, a small circular section of the page bounded by a blue line, now signifies a space from which things might be 'missing'. In her analysis of this space, Anna draws on previous visual information from both her personal experience of what a cat's face looks like, but also her textual experience of how a cat's face might be represented two-dimensionally: it is common practice in visual representation in children's books and comics for facial features to be represented simply by a mark of some kind. Anna continues to focus her gaze on this space, maintaining analytic mode, but mediating the outcome of her textual analysis interpersonally through the linguistic mode, 'eyes, I doing eyes': the space was missing eyes.

Table 2 **Episode 3**

Language		*Vocalization*	*Gesture*	*Gaze*	*Action*	*Semiotic Object*
EPISODE 3 (20 secs)						
Anna	eyes I doing eyes			gaze on cat's face		cat has one red zigzag eye
Rob	you're doing the eyes right			Rob's gaze on Anna's marking	makes small zigzag on top right of Rob's cat's face Rob moves forward	
Anna	ats eyes		points at mark on cat's face	looks at Rob		
Rob	that's his face, yes, you doing the eyes			gaze on cat's face	Anna makes zigzag on other side of face parallel to first	two adjacent red zigzags across top of cat's face
Anna	there's eyes		points at cat's face	looks at Rob gaze on cat's face	hands on either side of face and elbows on table	
Rob	red eyes	[m] 3 secs				
Anna	mouf				makes small zigzag in between eyes	continuous horizontal red zigzag on cat's face
Rob	do his mouth					
Anna	that's mouf		points to mouth	looks at Rob		
Rob	there's his mouth			looks at mouth		
Anna	yea				removes finger from page	
Rob	yes					
Anna	an nose			looks at Rob		
Rob	and his nose					
Anna	yes			looks at face		
Anna	thas nose			looks at Rob	makes quick zigzag above eyes	small red zigzag above but touching continuous one
Rob	there's his nose		Anna points to nose	Rob's gaze on cat		

Anna now leans forward over the page in preparation for action, and Rob also moves himself further up to the table and leans over the page to watch closely what Anna does, at the same time encouraging her through an affirmative comment, 'you're doing the eyes, right'. Anna has stated what she intends to represent prior to making the mark; the more intense involvement on Rob's part reflects his professional interest in the form of these marks and the extent to which they reflect a level of physical resemblance to the object represented. Anna's gaze remains intently on the cat's face as she makes a small, discrete zigzag on the top right hand side of the cat's face, carefully placing it within the bounding framework created by the outline. Her gaze retains its analytic focus, but this time to monitor the placing of her mark. She now moves her gaze from the mark she has just made to look at Rob's face, shifting from analytic to interpersonal gaze to signal her need to involve him in the process; she makes a deictic, pointing gesture with her forefinger to indicate where the 'eyes' mark is located in the space and then uses language to ascribe it a representational status: 'ats eyes'. Rob's verbal acceptance of her ascription, 'you doing the eyes', completes the process. For Anna, although she has made her mark in a position on the cat's face such that it might resemble an eye, nevertheless, there is still no necessary link between her stated intention at the start of the Episode to represent eyes and any resemblance the mark may have to the real thing: it is the physical, analytical and interpersonal process of making and placing it that realizes the representation. The movement between analytic and interpersonal gaze frames what could be described as an interpretative arena, where the whole process of ideational reconstruction is drawn into an interpersonal, interactive environment in which hermeneutic questions can be raised and worked on.

Anna's gaze now moves from Rob to the cat's face, from interpersonal to analytic mode, and she quickly adds a second, small red zigzag on the other side of the face, parallel with the first. She goes through the same process again, coordinating gaze, language, and gesture and ascribing the identity 'eyes' to the second mark as well. It is likely that this second mark is another representation of 'eyes' rather than representing the second 'eye', in much the same way that she made two distinct marks to represent 'cat' previously. Each mark represents a complete part, and in this case the plural form of the linguistic ascription 'eyes' confirms this: whilst Anna is still developing as a language user the linguistic forms she uses are, nevertheless, highly motivated. Once again she moves her gaze from Rob's face back to the page, this time putting her elbows on the table and her hands on either side of her face to enable her to look at the cat's face more intently. What Anna now sees is the cat's face with two red marks in the position where eyes would

usually be placed. The face now displays two systems of marking: one where the representative identity of the mark is ascribed in the course of interpersonal interaction; the other is the system in which the marks bear a physical resemblance to an illustration of eyes. It could also be argued that in the course of deciding to represent 'eyes' a second time, Anna is made visually aware of the effect she has made by placing the second mark adjacent to the first rather than anywhere else within the boundary of the face outline: it also *resembles* a face with two eyes.

Mouth

The space now signifies 'a face that has eyes'; it remains open whether there is anything else missing from it. This question continues to inform her looking and Anna's gaze is directed at the 'face' on the page in an extended and concentrated way. She breaks the silence sharply by her declaration of 'mouf' in response to this visual interrogation. She now makes another small zigzag in between the two eyes to represent the missing mouth, and in effect joining them together. This mark belongs to the set of missing features that Anna has been adding to the face. A semantic connection is used in placing this mark adjacent to the 'eyes': Anna had previously counterpoised the resources of space and mark; here, she connects the marks by placing them in close proximity to each other; in other words, as well as using the relationship of marks to space as a resource, she is also using the relationship of marks to each other. Having completed the mouth, she once again moves her gaze from the mark on the page to Rob's face, returning to the interpersonal mode and drawing her work into the interpretative arena. She tells him what she has represented, 'that's mouf' and then uses a gesture, pointing with her forefinger, to show him its exact position on the page. Rob affirms what she says, echoing the pattern of language that Anna has used, 'there's his mouth'; the representational status of the mark is agreed.

Nose

A break in the pattern of this interaction occurs after this with Anna's question, 'an nose?'. This question follows directly from the interactive sequence about the mouth, without Anna turning her gaze back to look again at the cat's face. This suggests that in the extended period of gaze, which characterized her interrogation of the page before the mouth was drawn, she had completed her analysis of the face and had decided that a 'nose' was the third missing element of the face. In other words, at this point the bounded space signifies 'a face with eyes, missing a mouth and nose'. Anna prioritizes 'eyes' then follows this with 'mouth', rather than

moving down the face in the traditional linear fashion: eyes, nose, mouth. Most likely the affective and sensual connotations of eyes and mouth are more significant to her than the less interesting connotations of 'nose'. The nose is marked using the same zigzag action and also placed adjacent to the other feature marks, but immediately above the eyes placing it according to the criterion of locating it in close proximity to the other marks representing features. Although they are not placed according to the conventional organization of features on a face, nevertheless there is a sense in which the final arrangement of her marks involves both representation and resemblance, sharing as they do both semantic features and the same visual and physical space. After completing the nose, Anna once again looks at Rob, moving back into the interpersonal mode and designating the mark's representative status, 'thas nos'. The face is now complete.

Conclusion

The analysis discussed here shows that at less than two years old, a child involved in drawing and marking activity is already engaged in the symbolic representation of meaning and able to develop her own system of coding. This is a refined and delicate process in which resources like space and mark are organized in such a way as to produce economical and creative resolutions to interpretative matters. The matter of producing even a greetings card is approached with an expectation that the object will have interpretative significance: marks can be made to transform the object and to represent and resemble things other than themselves. This process involves sophisticated reasoning which is rooted in commonplace social experiences and interactions, and familiar visual and material resources.

The zigzag that is used in all the representational activity described is both abstract and symbolic, in that it is used to represent a range of meanings and its graphic form has no visual connection or resemblance to any material object except itself. The specification of meaning that Anna applies to these marks is derived through her careful and motivated coordination of language, vocalization, gesture, gaze and action: meaning is embodied, in other words. Microanalysis of these physical, bodily means provides a visible indicator of the *process* of constructing symbolic meanings. Using an analytic method of this kind can be a powerful tool to expand understanding of the very earliest stages of literacy. Describing this generation of symbolic meaning as an embodied process, in which the boundaries between bodily and cognitive activity are flexible, makes the nature of young children's rational thinking far more accessible to description.

In all of this activity, gaze plays a significant role in a sighted child; far from being transparent, it is a multiply constituted mode. Through its

analytic function, gaze mediates the visual and spatial analysis involved in the interpretation and construction of visual meaning: through the interpersonal functions, the child can draw, hold and direct attention; through its expressive function, feelings and attitudes are mediated. The systematic movement between these functions of gaze, coordinated with language, gesture and action, frames what has been described as an interpretative arena where these difficult questions of symbolic representation can be worked on by the child, using the adult as a resource to support the generation of meanings.

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