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## **Fish in the water of culture': signs and symbols in young children's drawing**

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*The graphical symbols young children use in their drawings reveal their sign-producing practices. Whilst children's earliest marks or 'graphical structures' appear to be universal (Matthews, 1999), analysis of children's drawings also point to a complex relationship between social semiotics and the socio-cultural contexts in which children create meanings (Vygotsky, 1978; Kress, 1997).*

*The data for this paper was collected during the first phase of doctoral research into young children's imaginative play, exploring how this relates to graphicacy and mathematical thinking. Drawings were gathered from children's self-initiated play in two nursery settings in England, and from two schools in the Netherlands.*

*The processes that facilitate the crossing of signs and shared meanings between one child and another was not immediately clear; however they can be understood through the means of 'joint attention', a human facility that allows us to pass on aspects of our culture through understanding others' intentionality, (Tomasello, 1999).*

*In all their graphicacy children 'internalize the communicative intentions behind the physical symbol...' (which), 'like linguistic symbols, may be internalized and used as aids for thinking' (Tomasello, 1999: 131). Finally sign use in this study is related to in children's mathematical graphics (Carruthers & Worthington, 2005, 2006). The study underscores the importance of drawing and symbolic play for young children in which meanings combine with culture to shape children's graphical narrative. It supports a social-semiotic perspective of children's mathematical graphics that originate in rich symbolic play and drawings: 'As Vygotsky (1978) saw so clearly, we are 'fish in the water of culture' (Tomasello, 1999: 215).*

**Key words:** drawing; graphicacy; signs; multi-modality; intentionality

## **Introduction**

Drawing and other symbolic systems are distinct human behaviours that originate in symbolic play and includes graphical 'signs', powerful symbolic (*psychological*) tools that allow children to signify meanings and originating within human cultures. Whilst culture is seen as 'a very recent evolutionary product' it is likely that we have a 'biologically-inherited social-cognitive ability to create and use social conventions and symbols' (Tomasello, 1999: 216). Certain graphical symbols such as wavy or zigzag lines have a timeless quality and appear in different cultures, for example as rivers, snakes and lightning in petroglyphs and rock painting (e.g. Golomb, 2002). Drawing research also shows how culture influences children's drawings around the world (e.g. Alland, 1983; Cox, 2005).

### **Signs and meanings: 'As in play, so too in drawing'** (Vygotsky, 1978: 110)

Socio-cultural contexts of home, nursery and school can provide children with rich opportunities for symbolic (imaginative) play and representation (Vygotsky, 1978). Imagination provides huge potential for young children's thinking (van Oers, 2005). Matthews identified 'structural principles' in young children's drawing and painting, revealing that 'the process of representation is universal. The elaboration of a few simple structural principles results in the high variety of imagery we see across temporal, spatial and cultural divides' (1998: 163). Vygotsky proposed that symbolic play 'can be understood as a very complex system of "speech" through gestures... It is only on the basis of these indicatory gestures that playthings themselves gradually acquire their meaning – just as drawing, while initially supported by gesture, becomes an independent sign' (1978: 108).

In their symbolic play children may signify 'horse' with a stick (as in Vygotsky's example) or use a brick with a pen to signify a 'remote control' for a pretend television (Worthington, 2009). Substituting the object's original cultural meaning with an alternative in their play also enables children to understand that traces made with fingers in mud or pen-marks on paper can also signify meanings and 'that symbols "represent", that they are not to be mistaken for the actual object they refer to' (Golomb, 2002: 19). Matthews argues that 'Far from being chaotic actions and random 'scribblings' children's use and organisation of visual media exhibits semantic and structural characteristics from the beginning' (1998: 90). These beginnings are exemplified by scribble-marks in Ben's 'big wheel' and Hannah's 'bubbles are going up to the surface' (Matthews, 1998, 93-94): Luquet terms this *fortuitous realism*, (2001: 163). '...the child must discover that the lines he makes can signify something' (Vygotsky, 1978: 113): with this realization children begin to make marks with an intention in mind (Cox, 2005).

The 'potentials of imagination' allow us to make and explore signs and by doing this, 'people make *images* of their reality' (van Oers, 2005: 5). Children explore personal meanings through their free drawing, an aspect of semiotics that includes gestures, actions, artefacts, role play, arrangements and models that explores the relationship between signs, meanings and socio-culturalism (Vygotsky, 1978; Kress; 1997; Pahl, 1999). Traditional semiotic theory viewed the relationship between the two parts of

signs (for example, a written 'X' and its signification 'kiss') as largely *arbitrary* (Saussure, 1983). However, Kress argues that from a *social semiotic* perspective, 'All signs are motivated in relation of signifier to signified, and all signs are always transparent to their makers...' (1993: 180). This is especially pertinent when one considers young children's self-initiated sign-making with gestures, found objects, junk models or drawings. From this perspective sign-making allows a complex interplay of thought and is rooted in children's imaginative play (Vygotsky, 1978; Worthington, 2009). Kress continues, '...and all signs are more or less opaque to readers': it is this opacity that this paper seeks to uncover.

## **Methodology**

Data for this study was gathered from two nursery settings in the south-west of England; a private nursery in a rural area and a maintained nursery within a Children's Centre in a large, multi-cultural city. Examples from the Netherlands are from two schools, one in a group 0 (nursery class) in Amsterdam and the other in a small rural town near the coast (a combined group 0 – 2 class, equivalent in England to the final year of nursery, Reception and Y1). Figures 9 and 10 are from two additional nurseries in England.

The qualitative data comprises young children's spontaneous, child-initiated drawings (and other visual representations) which they made without adult suggestion or intervention. The adult observing (teachers and the author of this paper) noted anything the child said: if this was not forthcoming when drawings were completed the adult commented 'this looks interesting' and recorded anything the child said. Since some of the children were very young, some comments were very brief.

This study is situated within an 'interpretative paradigm' that acknowledges the researcher's subjectivity (Ring, 2005) and is a naturalistic study, based 'on the premise that child-art ought to be studied within an ecologically meaningful context' (Golomb, 2002: 4). It is rooted in socio-cultural and social-semiotic (multi-modal) theories.

### **Ongoing research: sign-use in mathematics**

The current study is a development of ongoing research into *children's mathematical graphics*, children's graphical texts that may include scribble-marks; drawings; personal symbols; letters and standard mathematical symbols. This research has revealed the potential of children's sign-creation and use in developing deep levels of understanding the abstract written language of mathematics (Carruthers & Worthington, 2005, 2006).

Researching the different ways in which children encode and communicate meanings in their drawings can further our understanding of both children's drawings and graphicacy in mathematics, described as subject that is 'really a matter of problem

solving with symbolic tools' (van Oers, 2001, p. 63). The larger (doctoral) study will continue to gather data of children's imaginative play, sign-use and creation through ethnographic case-studies of the children now that they are in Reception classes in schools.

### **Encoding and analysing graphicacy**

This paper explores two particular aspects; firstly children's graphical signs in their drawings from a socio-cultural and social-semiotic perspective and secondly, the processes that enable children to create, adapt and share signs and modify them over time. The data revealed distinctive use of graphical 'signs' including horizontal and vertical lines, circles, zigzags and crosses. Drawings that contained zigzags and crosses were eventually chosen for investigation and are the focus of this paper. In his 'generational structures', Matthews identified zigzags as *travelling zigzags* and crosses as *push-pull marks*, (1999).

*Multi-modality* describes social-semiotic, communicative practices that are 'visual, textual and artefactual' (Pahl, 2002); they are as much 'texts' as arrangements of various elements of letters and words on a page and their meanings can be 'read' and allow linguistic modes of analysis to be applied to a wide range of 'texts' including drawings and other visual representations (Kress & van Leeuwen, 2001). 'What it is possible to express and represent readily, easily... given its materiality and given the cultural and social history of that mode... we can ask about graphic marks on a two-dimensional surface'. The various media and modes of symbolic play and representation provide particular *symbolic affordances*, (Kress & van Leeuwen, 2001: 144). With children's drawings we can ask what possibilities (what *semiotic potential*) the children's graphic marks and signs offer; what they 'are best for' (Jewitt & Kress, 2003: 14). There is clearly a relationship between Vygotsky's analysis of symbolic play (1978) and Kress's use of the term *affordances* of multimodal texts and practices.

Van Leeuwen emphasises, 'studying the semiotic potential of a given resource... is drawing up of an inventory of past and present and may be also future resources and their uses. By nature such inventories are never complete', (van Leeuwen, 2004: 5). We can see what such an 'inventory of pens and pinking shears' (or even an 'inventory of zigzags') might include by considering table 1. Different tools and media and different graphical marks and signs provide different affordances. In making choices and decisions about the signs they use in their drawings, children recognise their *semiotic potential* and exploit this to signify and communicate particular meanings.

### **1. Zigzags**

The examples include cut-outs and drawings of *zigzags* as coded signs for 'sharp teeth', 'many teeth' or a 'fierce animal': the children use 'those forms for the expression of their meaning which best suggest or carry the meaning, and they do so

in any medium in which they make signs' (Kress, 1997: 12). Jemima was cutting paper with pinking shears and seeing the serrated edge of the paper she commented 'it's a crocodile!!' Kress highlights a 4-year old who noticed the slice of toast her father had bitten, 'You made it like a crocodile!' (1997: 87). He argues that 'The child selects – no doubt unconsciously – those characteristics which he regards as most important for him in the thing he wants to represent... The relation which united form and meaning is one of analogy... This relation of analogy leads to metaphors ... Motivated signs are therefore always metaphors; formed through the process of metaphors' (1997: 93).



**Figure 1:** Sterre drew herself at the beach (NL)

Sterre named the triangles(zigzags) at the top of her page 'flags' (figure 1) and those she cut with pinking shears at the foot of the page, 'shadow of the flags'. She drew zigzags to represent water and 'beach shoes', adding short zigzags (like a letter 'M') to signify birds in flight. The use of such signs also suggests *intellectual realism*, where children represent 'abstract elements which only exist in the mind of the artist... the essential elements of the represented object, and to preserve each in its characteristic shape' (Luquet, 2001: 102;105). It is possible that Sterre may have been exploring a particular schema (Athey, 2007) though there was no information on this from her teacher.

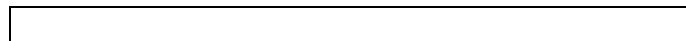
In figure 2 Aman used a twig to draw 'boats' in sand and completing the top of each with a wavy line she explained this was 'water'. By combining the curved line of the boat's hull with the wavy (or zigzag) line it appeared that Aman's intended meaning was *boat-on-water*. She had drawn what appears to be a 'portmanteau' sign where, rather than combing two *words* she combined two separate graphical signs.

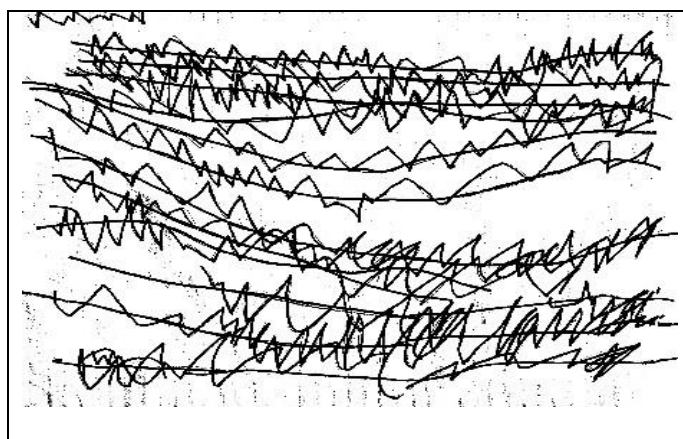


**Figure 2:** Aman's 'boat-water' symbol (NL)

Combining and transforming symbols allows children to create and communicate complex meanings (Kress, 1997; Pahl, 1999. Pahl writes of a child transforming a junk model she had made:

“Her mind was ‘internally ‘gluing together’ different concepts ... The things that are linked in the mind have become linked in the material world...using one idea the children are driven by internal links within them to explore other possibilities. This reflects both the children’s inner thoughts and their interest in how the object looks. Both impulses are at work. If an object reminds children of something else, they are able to develop it structurally so that it becomes the thing inside their heads. The meanings change and grow inside their minds... These meanings then develop as they move from one concept to another” (1999: 20 – 21).





**Figure 3:** Nathan's 'writing' (UK)

Children also use zigzags to signify 'writing' in a generalised way, (e.g. Newman, 1984; Kress, 1997; Matthews, 2003). On one side of his paper (*not shown*) Nathan drew a horizontal line with zigzags as his 'birthday cake' (his mum made a 'caterpillar'-shaped birthday cake for his 4<sup>th</sup> birthday). Turning his paper over, he repeated the same lines and zigzags (figure 4) now referring to them as 'writing'. In contrast Jemima moved her finger across her zigzag marks 'reading' a story about a kitten (*not shown*).

**Table 1:** children's use of zigzags in the data

<b>Animals</b>	Crocodiles; dragons; monsters; sea-monsters ( <i>powerful, fierce</i> )
<b>Power</b>	Electricity; lightening
<b>Drawings of people</b>	Hair; teeth; beach shoes
<b>Landscape features</b>	Clouds; sky; water (waves, sea); 'little prickly bushes' ( <i>signifying the Christmas story</i> )
<b>Other</b>	Birds; flags; 'shadow of flags'; stairs; caterpillar
<b>Combined symbols</b>	'Boat-water' symbol
<b>Writing</b>	to signify 'writing' ( <i>i.e. 'this is writing'</i> ); to carry specific <i>content</i>

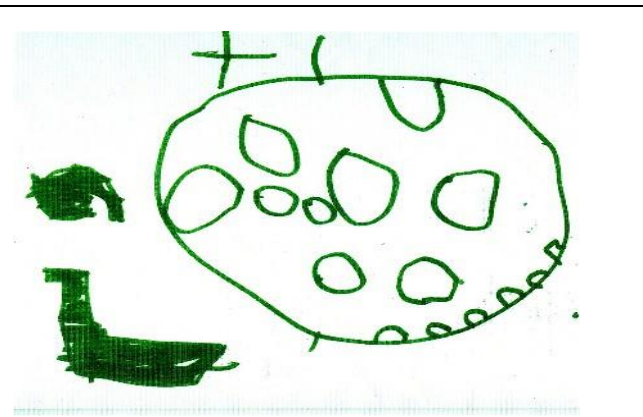
## 2: Crosses



Crosses have high visual impact and are often seen in western societies, for example outdoors on ambulances and road signs, and indoors on remote-controls. The 'x' that signifies a 'kiss' on a birthday card is likely to be the first sign to which children's attention is drawn and which they make.

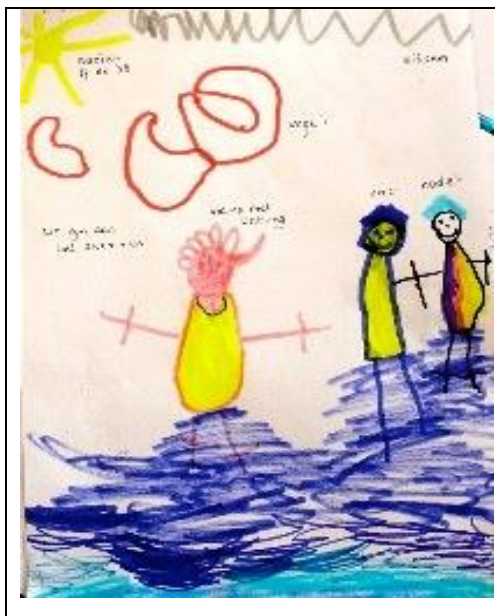


**Figure 4:** Jazper's aeroplane (UK)  
(UK)



**Figure 5:** Mohit's 'world' with planes

Jazper explained 'This is my gun' (in the centre): the cross top-right was 'my flyer' (figure 4). Mohit (figure 5) use two different signs to signify one meaning; a cross to signify 'a plane flying above the world' and (lower left), he drew an aeroplane in profile.



**Figure 6:** Nadieh 'at the beach' (NL)

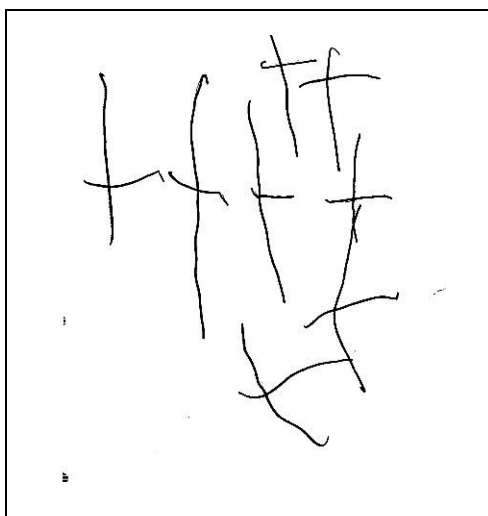


**Figure 7:** Kyran's drawing of 'Mummy' (UK)



Nadieh and Kyran drew hands as crosses (figures 6 and 7). Kyran observed ‘she’s got funny hands!’ before extending the cross to encircle the drawing of his mum. Nadieh (figure 6) included ‘horseshoe’ signs in her drawing to signify ‘birds flying’, more often represented in young children’s drawings in the west, as a ‘V’, ‘M’ or a ‘W’ (zigzag) sign as Sterre did (see figure 1).

Nathan chose to write a ‘shopping list’ when playing shops (figure 8), drawing crosses to signify items on the ‘carrots, potatoes and spaghetti’ (his writing here is distinct from that in figure 3). His mother explained that they always wrote a list before the family went to the supermarket: Nathan had drawn on his home knowledge in his play at nursery.



**Figure 8:** Nathan’s shopping list (UK)

### **Graphicacy: signs in drawing and mathematics**

These findings show how individuals use graphical signs to signify single and multiple meanings. In their peer groups children share a common understanding of some symbols, and in both countries used certain signs to signify the same meanings. Tomasello argues that the human ability of *intentionality* (1999: 6) supports sign-making and use. Once they understand that others have intentions ‘like me’ a ‘whole new world’ begins to open, ‘a world populated by material and symbolic artefacts and social practices that members of their culture, both past and present, have created... ‘Children now come to comprehend how “we” use artefacts and practices of our culture – what they are “for”’, (Tomasello, 1999: 91). The children appropriated and adapted signs they had seen others use, making them available as artefacts for their social group. One of Bakhtin’s significant legacies was his perspective on ‘utterances’ that reflects others’ speech through ‘ventriloquation’ (Bakhtin, 1981) or *multivoicedness* (Wertsch, 1991). There is also an element of many ‘voices’ in these examples of children’s drawings and graphical signs that reveals their *polyadic* nature and ‘pre-history’ (Worthington, 2005: 79).

In their mathematical graphics individuals introduce personal signs such as hands or arrows to support their thinking and communicate meanings: signs also ‘cross’ from one child to another and are adapted by individuals for specific mathematical purposes (Carruthers & Worthington, 2008). Children’s signs become cultural tools that are available to the peer group: Tomasello explains this cumulative cultural evolution of cultural artefacts such as signs as the ‘ratchet effect’ (1999: 40).

However, this does not fully explain how children understand the potential of graphic signs to communicate meaning in a specific linguistic context that has its own symbolic language - such as mathematics. In the final two examples young children from two different nurseries drew on their existing knowledge of the symbolic potential of graphical signs to communicate new meanings to their peers.



**Figure 9:** Mark: ‘No! Keep out!’ (UK)



**Figure 10:** Daniel’s ‘closed’ sign (UK)

In the ‘garage’ role-play area outside Mark was playing in an area enclosed on three sides. He objected that a number of boys were riding their bikes and wheeled toys into ‘his’ corner and insisted ‘No! Keep out!’ ‘You can’t come here!’ Since his verbal request failed to have the desired effect Mark chose an alternative way to communicate his message and, fetching a stick of chalk he drew large crosses (figure 10), emphasising his message by repeating his verbal instructions as he drew. Finally the boys ‘heard’ his request and moved away from where Mark wanted to play (Carruthers & Worthington, 2006).

Daniel (figure 10) had been playing shops and decided to make a sign to show when the shop was ‘open’ and another to show that it was ‘closed’. His teacher had noticed what he was doing and Daniel explained:

Daniel: *It’s closed now, the café is closed*

Adult: *How do I know it's closed?*

Daniel, *Look here, see? Closed, that means it's closed.*

Daniel pointed to his picture of face crossed out on chalk board. Next he rubbed his drawing out and drew a face without a cross:

Daniel: *Look! Open that means its open now....Oh dear...*

Drawing a cross over his drawing of a face he explained ...*it's closed.*

I believe that these examples are highly significant and point to children's ability to create, select and adapt signs: they suggest a 'crossing point' enabling them to see that graphical marks can also be used to communicate specific *mathematical* meanings.

### **Discussion**

This study points to a 'natural history' of graphical signs. In the settings and schools in both countries the children had daily, extended periods for free, child-initiated play. In one of the nursery settings for example, staff had developed a particular interest in children's symbolic play and had become highly responsive at tuning into children's 'voices' including their drawings and other marks. Their insightful observations enabled them to understand and extend children's play and graphicacy.

Matthews argues that children's drawing '...is not defined in terms of a body of knowledge, planned a priori, and simply transmitted to the learner. Nor is it tied to the transmission of any particular culture'. He encourages teachers and practitioners to 'understand some of the mechanisms which drive representational thought' (1999: 163) and raises concerns about young children's experiences of drawing, concerns shared by others, (e.g. Matthews, 1999; Anning & Ring, 2004 and Ring, 2005). The teaching of 'written' mathematics continues to raise concerns (Carruthers & Worthington, 2006) although a recent government report on teaching mathematics has for the first time given prominence to graphics in early childhood mathematics (birth – 8 years), (DCSF, 2008).

Howard and Miles (2008) have proposed a *process theory* of play which suggests playful situations lead to lower cognitive thresholds and subsequently an increased range of potential behaviours. The increased behavioural fluency in children's play is manifested in the emergence of a wider range of purposeful behaviour and problem solving strategies, and ultimately superior task performance (McInnes, Howard, Miles and Crowley, in press).

This playfulness appears to be borne out by the findings here as children freely explored graphical signs and communicated meanings in their drawings: clearly effective play experiences support children's imagination, allowing them to flexibly negotiate many symbolic landscapes.

However, once they move beyond the nursery the reality may not necessarily match the aspirations of official guidance (Wood, 2009). In the current education climate in England it appears that *effective play* may often be the most misunderstood, suggesting that graphicacy may remain in jeopardy unless understanding of play improves in all Foundation settings.

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