

How can we develop children's mark making and independence to encourage their use of mathematical graphics?

Bannerman Road is a diverse, multilingual, inner city school that faces a lot of challenges. Many of our cohort began the year with a significant need to develop their fine motor and communication & language skills in order for them to access other aspects of the Early Years curriculum. Due to a high need in these areas, I observed that children were not choosing to make marks, particularly to represent number and I identified a need for this to be a primary focus in order to enhance the mathematical development of the children across the two reception classes.

As a result of this observation, I decided to research this specific area of children's mathematical development. I believed that through consistent practitioner modelling, quality first teaching and engaging activities, it would allow the children to use and interpret their own mathematical graphics. This would become evident in a range of contexts to advance their understanding and independence.

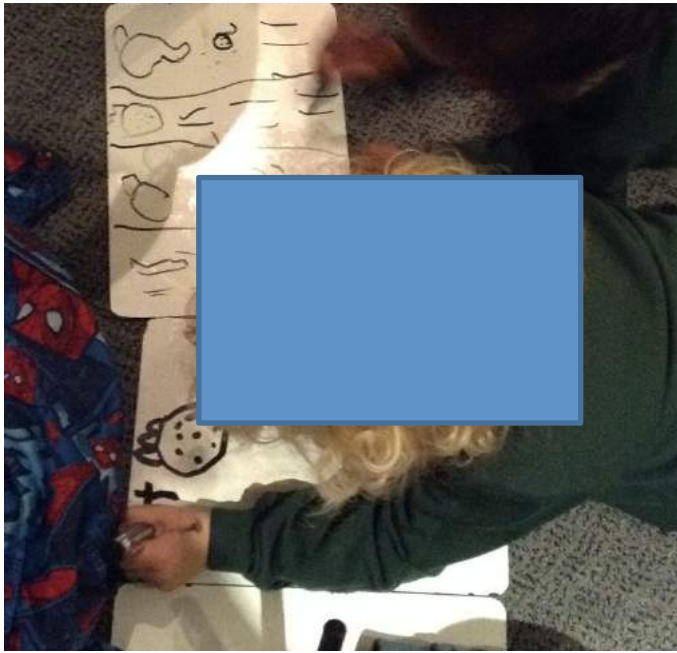
My initial thoughts were not that the children were not ready, on the contrary, I believed that perhaps the children had just not been given the right opportunities to develop this area of learning. I wanted to identify the reason behind the lack of mathematical graphics. As we are aware there are other ways to observe understanding without the children having to communicate it through speaking. By teaching the children contexts in which they could make marks for mathematical concepts and demonstrate learning without having to explain verbally, I felt that it would remove some of the barriers our children face. Another idea was whether or not the adults working in the room were noticing or understanding the maths that was already happening in order to extend learning as it was taking place. Elizabeth Curruthers and Maulfry Worthington (2006) explore the idea of Saint-Exupery (1958), where a child had drawn pictures that had been incorrectly interpreted by adults and as a result; the children were discouraged from making marks. "Grown-ups never understand anything by themselves, and it is tiresome for children to be always and forever explaining things to them." This addresses the issue that we need to be careful to support children so we don't put them off mark making altogether by making assumptions as to what they have created. Children

should be given the opportunity to demonstrate their learning without unnecessary interruptions from adults. They should be allowed to represent their learning in a way that they choose and their ideas should never be considered as wrong. In fact as in Elizabeth Curruthers and Maulfry Worthington (2006) when quoting the QCA (2000) pp71-2 “Teachers are recommended to promote confidence in children when they begin to record their mathematics”. ‘Asking children to “put something on paper” about what they have done or have found out will allow them to choose how to record or whether to for example, use a picture, some kind of tally or write a number.’

As a starting point for my research, I wanted to use every day routines and opportunities as a chance to model making marks to represent number. I began to make various tallies using a range of marks to show the children that you do not have to be able to write numbers to make mathematical marks. Key times that this was implemented were during morning registration, snack times and group discussions. For example; when sitting in a circle for snack time, I drew a picture of each piece of fruit chosen as each child asked for it. During morning registration, I drew a circle each time a boy said ‘Good morning’ and a triangle for each time it was a girl. After a few weeks I began leaving out whiteboards and pens during these times to encourage children to join in with the mark making. I made sure to stress that they could make any marks they wanted as it was their own choice how to record their ideas. Here are some of the ideas the children came up with.

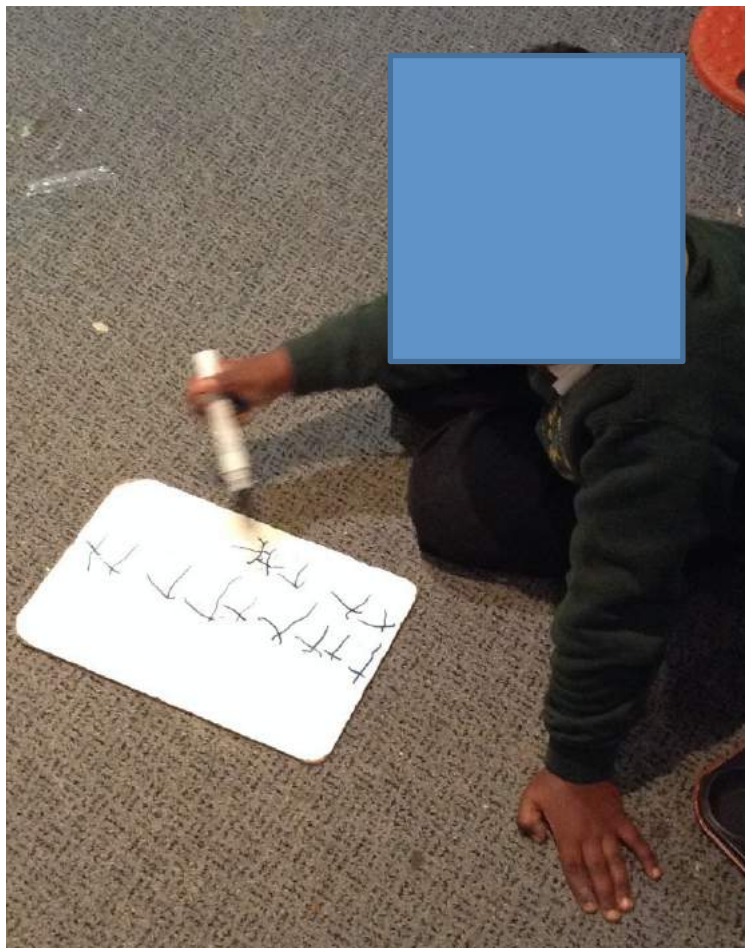
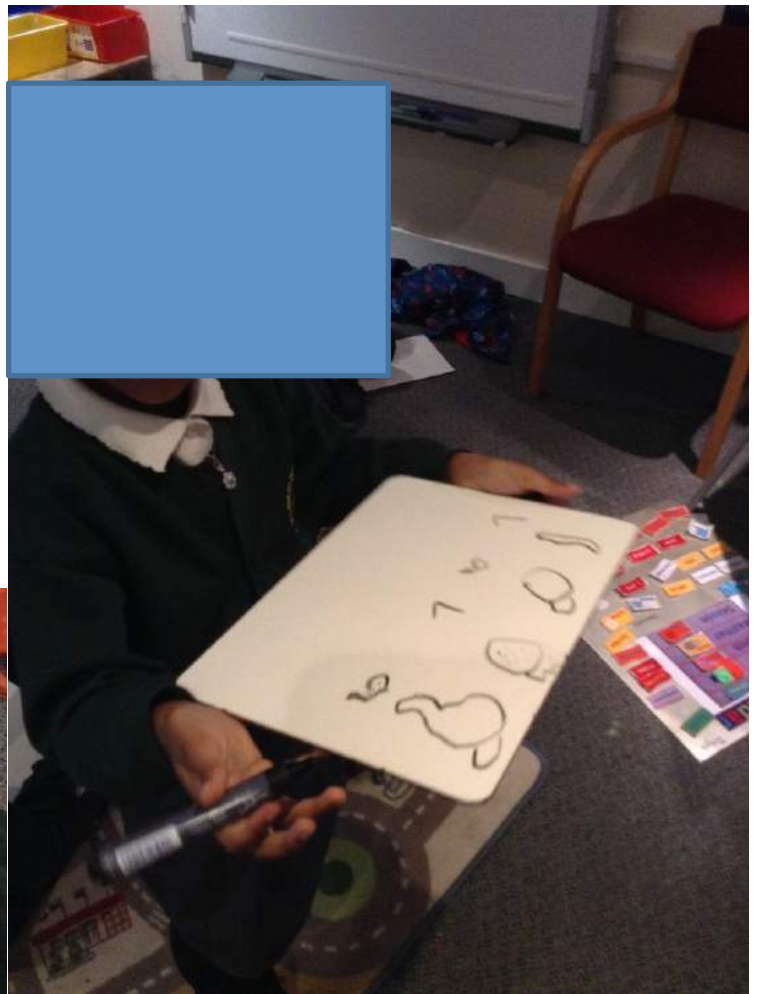


The girls chose to make marks alongside me as I made a tally of the fruit choices. They decided that if the children chose a banana they would do a + sign. If they chose an apple then they would draw a smiley face. They were able to use the marks they had created to count and find the total number for each choice.



The child in the top of the picture drew each fruit item at the top of the board and made a classic tally mark as each fruit was chosen. The child at the bottom put a dot onto her apple picture each time an apple was chosen. She put a cross next to it each time the children chose banana.

The girl in the picture on the right chose to wait until I had finished making my marks and then count the total. She then wrote the total number for each choice under her own pictures of each fruit.



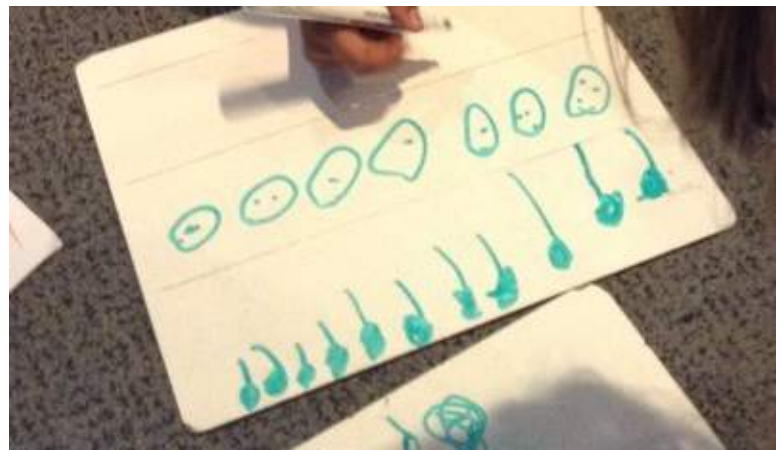
The boy on the left made a cross each time someone said they wanted a piece of fruit and made no mark each time someone did not want any fruit.

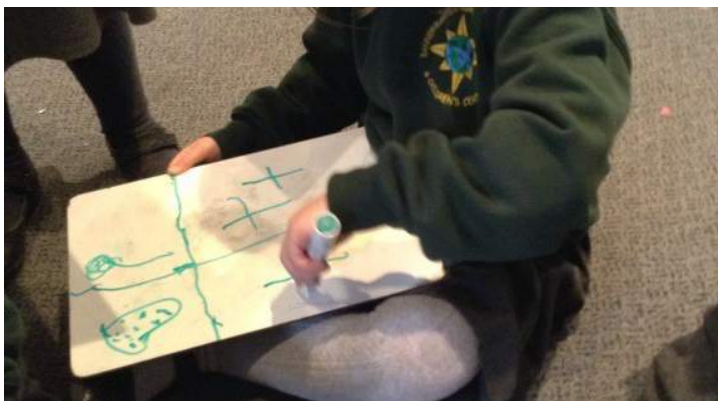
As you can see by removing the stigma that mathematical mark making has to be done in a certain way, each child was able to access the learning at their own level and represent their ideas in their own way. Each was able to explain the ideas behind the marks they had made and had the confidence to do so. Not all of the children were able to make an accurate number of marks or count them accurately but their learning was accepted and their mathematical thinking developed through teacher guidance. This shows that as in Vygotsky 1982 (P74) 'it is the meaning that is important, not the sign. We can change the sign, but retain the meaning.' After this learning had been modelled a few times and the children joined in the group mark making, they began to explore their own interests independently. They created their own surveys and collected their own information. Again not all of their ideas make sense in the way you would necessarily expect but the learning taking place was clear and the children had ownership of it.



This girl chose to ask if her friends prefer eyes or lollipops. Although an abstract idea she is able to use her picture representations to tell me that more children chose eyes. She said 'I think it's cos you can see with them.'

This girl asks her friends 'Do you prefer lollies or cookies?' As her friends answer she draws a cookie or a lollipop depending on their choice. She draws them in a line to make it easier to count them at the end.





This girl chose to ask her friends if they prefer pizza or ice cream. She draws a picture of each and makes a mark in the correct column as they chose.

Due to the success of this we decided as a team to incorporate making marks into every aspect of our math carpet sessions. Each time we introduced a new concept, the children then went off and independently recreated the activity adapted with their own methods and fascinations. Here are some of the contexts in which this took place.

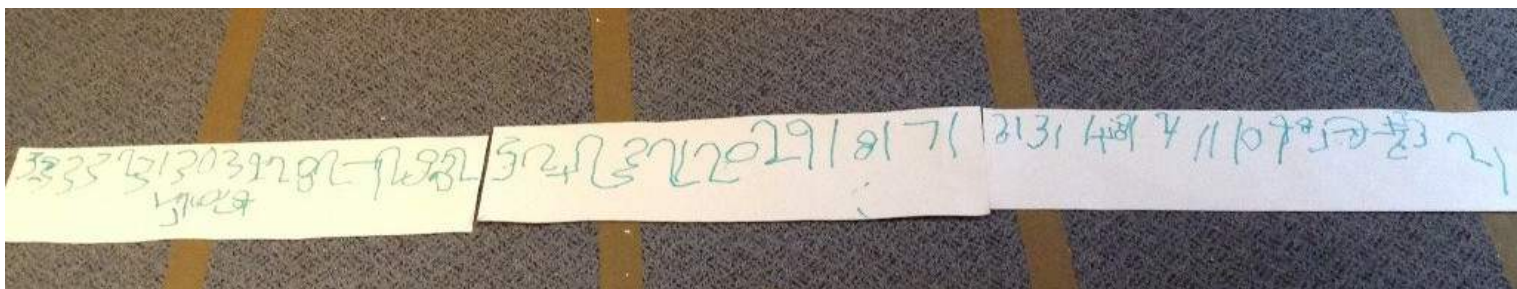
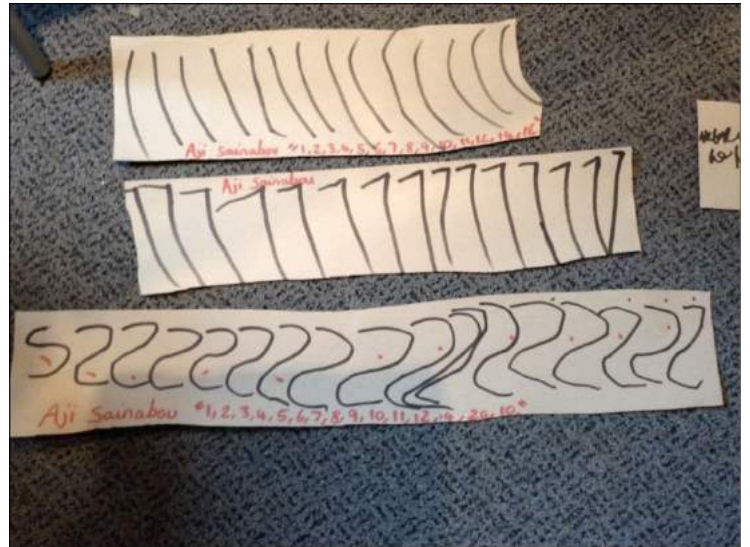
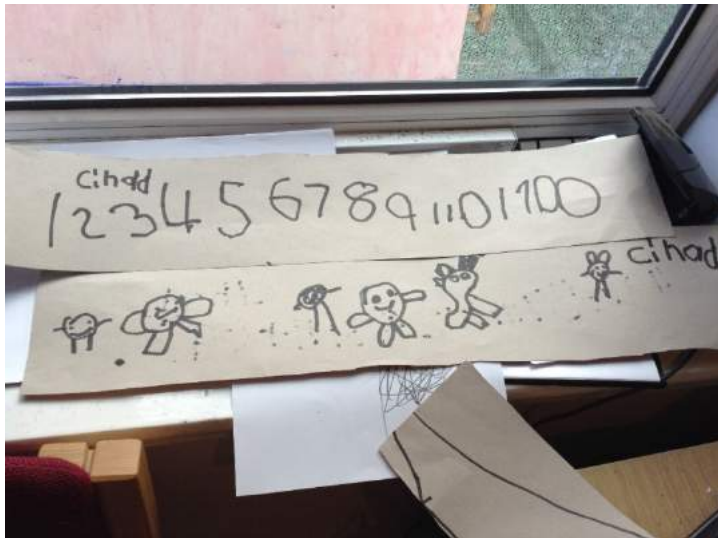
Context: Realising anything can be counted – the children were taking part in an exercise challenge and recording a mark each time their partner did a hop, star jump, clap etc.



Context: conservation of number – the children were making marks to correspond to the chosen numeral.



Context: ordering numbers – the children were creating their own number lines to show their understanding of number. Some children used pictures, some the same number repeated and some the consecutive numbers in the correct order.

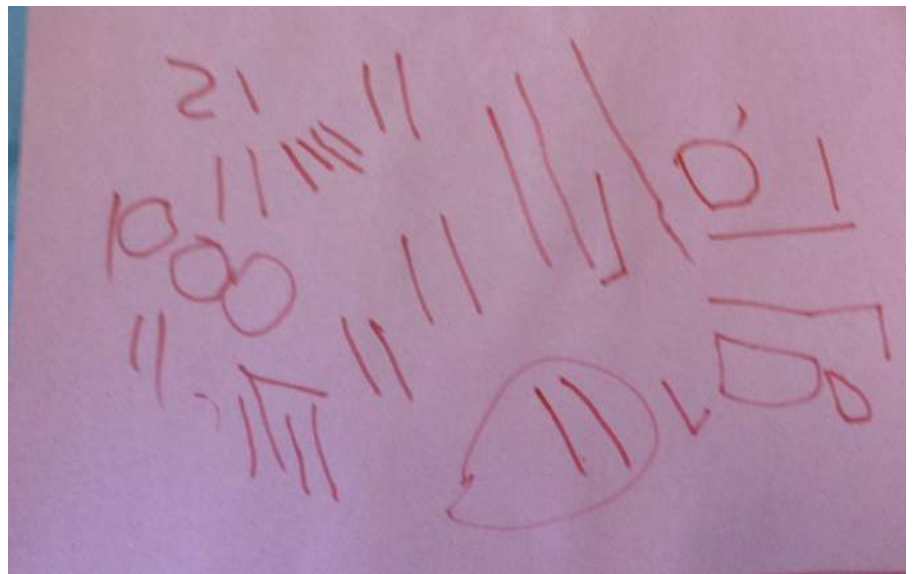
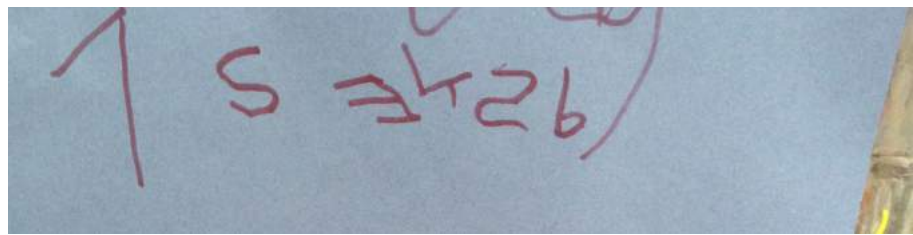


As my research progressed throughout the year, I found that the children became more able to input ideas during the course of the day. They began to explore their own interests independently and with peers. This progress was supported by providing children with a starting point to make mathematical marks and giving them the freedom to explore and have a go. Staff allowed the children to make marks to represent number in their own way and provided a systematic approach to allow the children to develop. This was achieved by modelling in stages and supporting the children through teacher modelling, guided sessions and time for independent learning. All ideas were accepted and celebrated, allowing the children to gain the confidence to try. Due to the children to recording in their own way, they followed their own line of enquiry and generated their own ideas for contexts for mathematical mark making.

As you can see throughout the year, the children moved towards more conventional and creative methods for making marks as they developed a

clearer understanding of numbers and mathematical recording. They were able to use their ideas and initiate their own contexts for demonstrating this. Different groups of children were able to take part at their own level and explain their thinking to allow teachers to assess the learning taking place. To conclude, here are some examples of recordings the children made towards the end of the research study.

Context: playing football, racing games or target games really engaged the boys in mathematical mark making. They chose to make marks to record their scores in a range of ways and areas of the classroom.



Some children chose to demonstrate their ideas through pictorial or creative approaches to mathematical mark making.

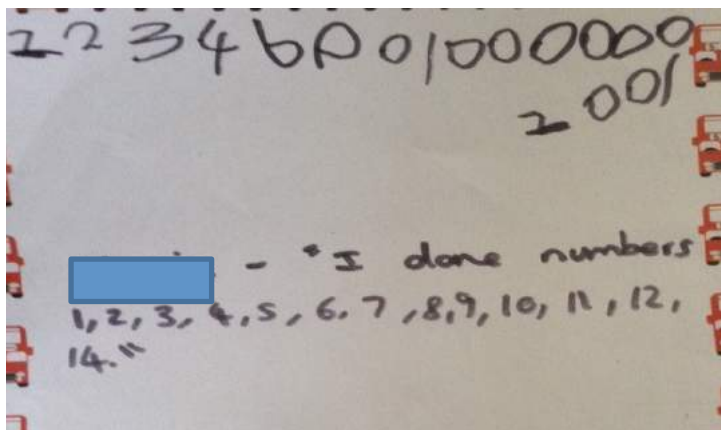
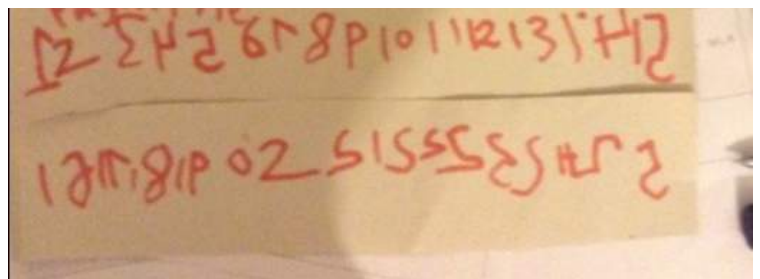
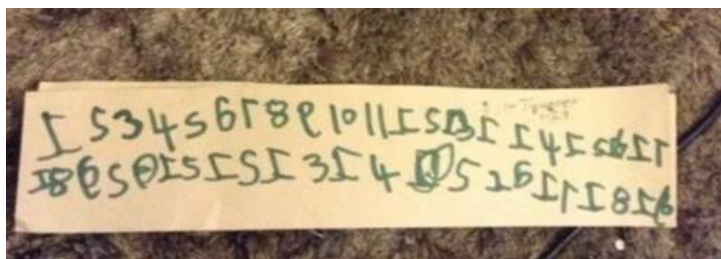


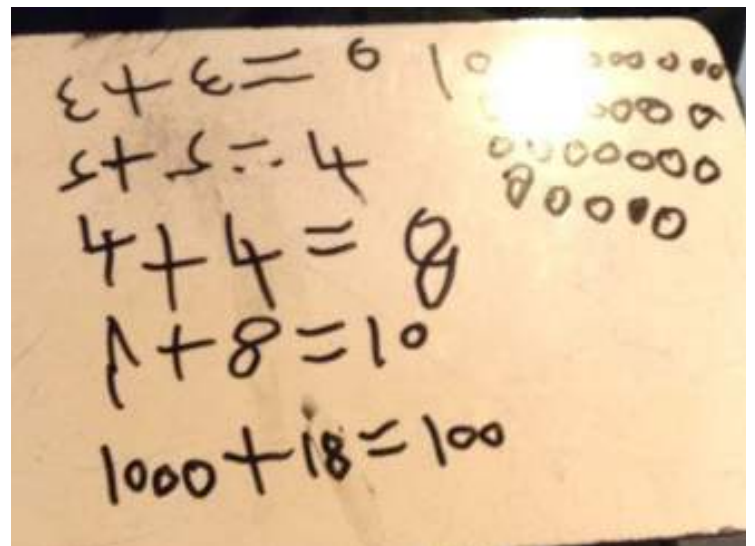
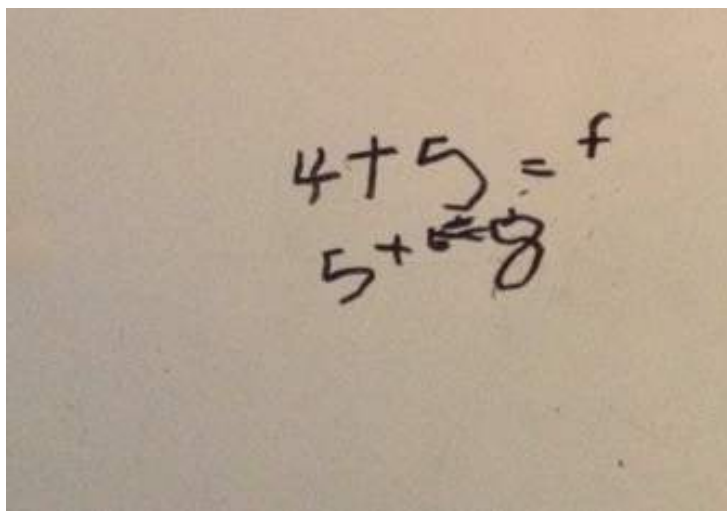
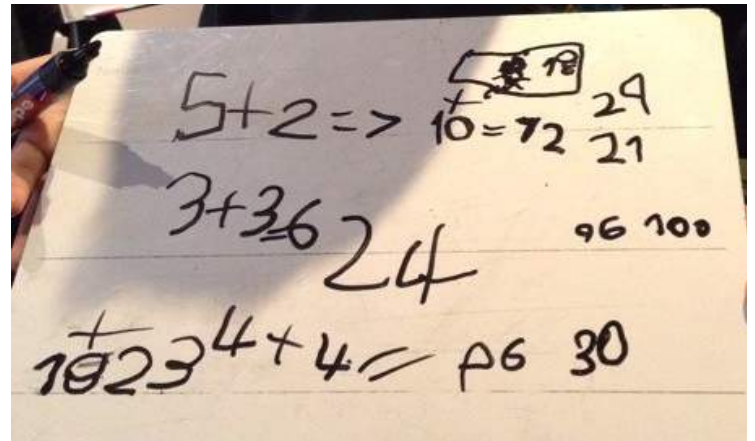
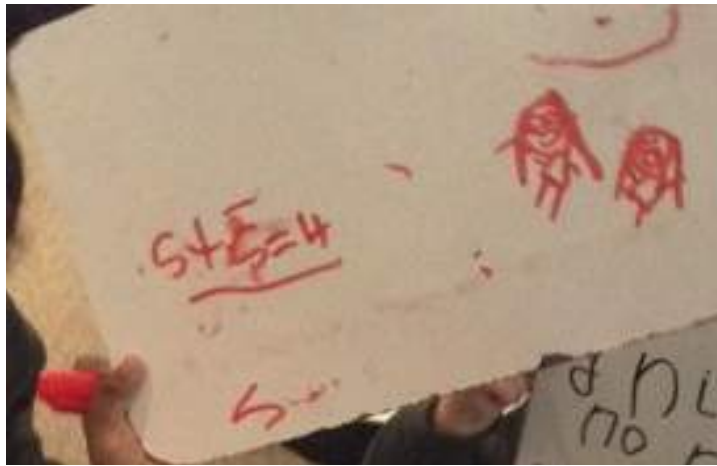
"I have drawn lots of gingerbread man. There's so many look. 1,2,3,4,5,6,7,8,9,10. There's 10 gingerbread man ad they so happy.

"I painted a 7, 5 and there's 6. I like painting numbers."

"Look I did a person, a flower and a sun. There's 7 petals and 1,2,3,4,5,6,7,8,9,10 bits on the sun."

Most recently the children have used actual numerals to record their ideas.





By Emma Davies

References

Elizabeth Carruthers and Maulfry Worthington (2006) Children's mathematics. Making marks, making meaning. 2nd edition. Sage Publications LTD. London.

QCA (2000) pp71-2 11 in Elizabeth Carruthers and Maulfry Worthington (2006) Children's mathematics. Making marks, making meaning. 2nd edition. Sage Publications LTD. London.

Vygotsky 1982 (P74) in Elizabeth Carruthers and Maulfry Worthington (2006) Children's mathematics. Making marks, making meaning. 2nd edition. Sage Publications LTD. London.