Rationale for Teen Number Extensions

Age

2 1/2 to 5 years

Background Information

"Arithmetic and the learning of the names of single numbers (units) is an area which is left to the common sense of the teacher. The greatest difficulty for the child is always with the small numbers, not with the bigger ones. The visual differences have been already noted by the child. As far as counting is concerned, he merely has difficulty in remembering the names of the numbers. The first twenty numbers present the greatest difficulty to the child.(p. 79)"¹

As early as 1939, Dr Montessori identified the difficulty that young children have with remembering the names of the teens numerals. To this day there is only one original material used in the counting of the teen numerals. Bring in the studies of modern day brain research applied to the educational setting and you begin to see the complexity behind the observation.

"Although the base-10 system has taken over most languages, how we say numbers in different languages runs the gamut from simple to complex. English has many inconsistencies in its number words. Ten has three forms: ten, -teen, and -ty. Eleven and twelve fit no pattern, and the ones are stated before the tens in the numbers 13 through 19.(p. 20)"²

While this gives reason to why the naming of the teen numerals is so difficult, it also leaves room for the development of bridging activities to assist children in the naming of these numerals in linear counting. Laboriously repeating a presentation in hope that the child will "soon get it" is inconsistent with Montessori pedagogy.

- What is the sequence from concrete to abstract and simple to complex?
- How do we go from whole to parts to whole within the sequence?
- What is the isolation of difficulty that allows the child to generalize to the whole?

How many times have you observed a child continuing to count the individual beads on a ten bar, but pick up a brown colored bead bar and automatically name it as eight? What is it that allows the child to automatically assume that the eight bar will have eight beads, but have to verify that the ten bar will always have ten beads?

When placing the black and white beads in the Snake Game, automatically knowing that the bead bar that has five black beads and four white beads has nine beads altogether, is using two visual clues together: subitizing and pattern recognition.

Subitizing is the ability of children, as young as two and a half, to recognize quantities of up to four or five without counting. Placing quantities of more than four in patterns (like those on a die) allows for further recognition of quantity without counting.

¹Montessori, Maria. Creative Development in the Child :Volume 2. Thiruvanmiyur: Kalakshetra Press. 2007. India.

² Sousa, David. How the Brain Learns Mathematics. Thousand Oaks, Corwin Press. 2008. USA.

Dr. Montessori's use of color in the colored bead stairs is a form of pattern making. Recognizing five black beads and four white beads automatically gives you nine beads altogether. Imagine if there was no color break after five, what would the natural solution be to find out how many beads there were on the bar? To count.

When children resort to counting by ones, they use valuable learning time on a repetitive task. To start counting at ten is cognitively more efficient and allows children to focus on the new learning task. To assist children in recognizing that a set of ten is ten, regardless of its formation is the initial task. To solidify this concept it is necessary to show "ten" in multiple ways. To this end the following extensions are suggested to tap into number patterns the children already recognizes, and move them to understanding the building and the naming of the teen numerals. They are to be shown after the initial presentation with the teen boards.

