

Summary of a maths education trial in Israel.

This paper appears on the Alton website- details are at the end of my article. This is a summary of that paper.

Observations and known factors about mathematics learning:

- Children with ADD and ADHD and PDD frequently learn to count by rote memory but are unable to apply this skill in situations where requiring mathematical thinking and problem solving.
- Most of the remedial maths programmes include concrete materials that require sequences of motor activities, which present a major challenge to children with motor planning difficulties.
- Mathematical abilities of children with Down Syndrome are very poor compared to their functioning in other areas. These children have great difficulties in understanding and using mathematics.
- Difficulties in the formation and understanding of number concepts and calculations are called dyscalculia.
- Children with DS found it easier to discriminate between 2 groups containing different numbers of elements when the differences between the groups, was visually markable.
- Most DS children do not use the process of counting to solve problems. Counting actually disturbs them. Even if they did count correctly, they could not say how many were there when asked. The children find it difficult to remain focussed and on task, needing assistance to do so.
- Yarmish (1988) concluded that DS children could benefit from a method that would enable them to identify quantities visually and globally with no need to count. This is a shift to focus training from auditory sequential mode to visual simultaneous mode using the right hemisphere of the brain.
- Children with DS can benefit from special instruction to learn coping strategies in solving mathematical problems.
- A reward system that combines vocal and a token reward is effective in reducing unwanted behaviour and shortening response time in math problem solving activities.

MIM programme

- Mediation Intervention in Math. Designed to help various children with math: dyscalculia- verbal, graphic, apraxic, ideagnostic and operational.
- Greatest effect was seen in trial with children and parents meeting weekly for 6 months to begin with; to develop a good understanding of basic mathematical concepts and problem solving
- The readiness of the children to learn was a key factor. Parents were trained in maths readiness skills from life - Living Maths and Applied maths
- The programme taught the parents how to consider the child's needs, interests, capacities, actively making it all compatible by providing the right environment for learning and improving the opportunity to learn now and in future experiences.
- 5 kinds of adult-child interactions- intentioned learning, wanting a reciprocal response from the child, perception and processing. eg moving a piece of chocolate just out of reach, meaningful experiences that give a child a value of an object, eg beautiful flower, opportunities of discussion and exploration of a topic, not just an apple, but where it came from, it's character that makes it different from a pear, feelings of competence giving a child a sense of satisfaction, with praise, wonderful..., explained behaviour, eg it's hot, let's take off our jacket. It is focussing behaviour and associating experiences with meaning and value.

- These criteria relate to focussing behaviour, exciting and associating experiences with meaning, expanding and elaborating behaviours, goal-setting behaviours, processes involving regulation of behaviour and teaching with competence. These all lead to better learning.
- Parents then were shown how to teach their young children to focus clearly on stimuli (eg., really looking and being engaged with a musical toy); to search for meaning; to associate, relate, compare and contrast perceptions; to seek explanations, relations, and general information beyond what is perceived through the senses. The need to please others and to summarise one's own behaviour, to plan ahead, and to match one's behaviour with the requirements of the task at hand.
- The programme was designed to build on what a child could already do and know, eg count to 5 then required to count 5 objects. It was also matched with the same determination of sequence and level of problem solving required. This dimension encouraged a higher level of thinking to solve a specific problem.
- A direct training programme was used to enhance the learning of mathematical concepts. Children were taught to recognise the pattern of 5 to begin with, not 1. It was found to be more efficient to start with 5 and then progress up and down from there. They learn quantities greater and smaller than 5. Five is easily identified by the children and can see five with their own fingers. Then it's easy to move to 10, which is a basic unit.
- The programme used the sequence of steps below:
 - *concrete materials
 - *visual picture of the concrete materials
 - *representational figures with dots of the concrete materials
 - *symbolic representation of the concrete materials
- The programme included activities that involve a transition from:
 - *manipulation
 - *pictorial
 - *using plastic numerals
 - *using graphic numerals
- The programme was in 2 parts- the training of the parents in how to create an adult – child interaction that constitutes a learning experience for the child and the presentation of the pedagogical principles that are essential for learning and practice in maths (
- The materials comprised of instruction cards for the parent to refer to, number cards from 1-10 in varying sizes, table top materials such as balls, small dolls, plastic animals, gross motor activities- big plastic forms of shapes that could be stood on and big number cubes.
- Results showed that parent teaching behaviour, setting up the right environment for learning and the visual configuration of learning numbers had a highly significant effect on the success of the children.
- Teachers and parents reported that the children expressed enthusiasm and excitement when they recognised numerals in the community- on road signs, products, announcements. Identifying most numbers and reading them aloud became a favourite learning game for them.

Conclusions

1. Young children with Down Syndrome can improve their mathematical thinking skills within a relatively short time (6 months) through training that combines a mediational approach, visual configurations of numbers and a developmental framework.
2. Weekly one hour sessions with the children supported by parental participation were significantly more efficient in raising children's mathematical thinking.

3. The MIM training improved the children's mathematical skills more than the traditional developmental approach.
4. The MIM training seemed to have improved the children's sequential memory and receptive vocabulary. Helping parents improve their mediational skills (teaching behaviours) could have improved children's attention, memory and verbal comprehension

This approach should be considered within the more comprehensive attempt to enhance the quality of parent child mediation within the child's natural environment, culture, and family.

Now to consider the Numicon programme!

It is:

- sequential in its approach
- multi sensory
- incorporates many activities and materials for home and school
- encourages and gives examples of how to apply in real situations
- language and concepts are included
- develops concrete learning and play before moving onto pictorial representation, graphic use of numerals and lastly, recording
- It incorporates problem solving
- It is interactive
- It is a visual programme through developing 'concept image'
- It is representational- the children can 'see' the problem and the relationships
- It is maths without counting

As a result everyone has positive attitudes about maths because it is rewarding and effective!

You can find the full article on:

<http://www.altonweb.com/cs/downsyndrome/index.htm?page=mlemath.html>

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