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Multiple Languages of Mathematics and Children with Disabilities

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Abstract

There are over three hundred ways to prove the theorem of Pythagoras, but generally the school chooses a single method. The multiplicity of methods that characterizes mathematics can favorite the hanging of those who, due to problems of cognitive impairment, he/she benefits from different roads than those usually adopted. Will be reported methods and paths made in more than ten years of activities carried out in collaboration with universities, research institutions and schools with primary school children suffering mainly from dyscalculia, autism, and agenesis of the corpus callosum. Our method starts from the premise that every child is unique and has its own preferred channel of learning. The problem of the adult is to understand what is the right channel for each child and allow him to follow him. This pedagogy of listening is of benefit for each child not only for the disabled one. In this research, in addition to activities carried out directly in the classroom, we have included examples of collaborations with experts (non-scientists) and teachers. The activities described and analyzed relate to projects carried out both in the classroom and individually .In conclusion, the multiplicity of languages (see Malaguzzi "The Hundred Languages of Children") often adopted in language teaching, provides good results also in mathematics especially with children with disabilities.

1. Introduction

This project was carried out in the belief that the multiplicity of methods in mathematics can be a great resource for solving problems that some boys and girls manifest in the approach to mathematics and logic. The aims of the project were mainly two :

1. To support the approach to the mathematics of children with disabilities. In particular, we have worked with children with dyscalculia, autism an agenesis of corpum callosum
2. Motivating the study of mathematics with children who do not have any kind of pathology proven, but which prove to be little interest in this matter.

We report in detail the results related to the ability to count with disabled children with difficulties and delays in the acquisition of this skill.

2. Count to twenty with children with disabilities aged between eight and ten years

2.1 Children with dyscalculia

The data refer to a group of 100 boys and girls aged between eight and ten years old suffering from severe dyscalculia. In all cases, the children examined had serious difficulties even in the count. We initially considered that the procedure of counting requires the possession of multiple skills. Below is the percentage distribution of the abilities of the children who participated in the project.

1. know the names of numerals in exact order. (86%);
2. be able to touch (or state or look at) each element of a set once and only once (96%)
3. be able to coordinate motor activity in the previous two skills (81%).

It was therefore decided to offer children the opportunity to count with four different approaches. The cards and subsidies were presented together, while in the deepening of each (in the order chosen by the child) has been devoted a session of about fifteen minutes during four different days. Only after

this steps we have devoted a session to each approach by asking the children to count a number between 0 and 20. Each child was asked to count to 18 using each of the different approaches (in different sessions). Here follow the results.
1.a Cardinal approach (comparison of the numbers of a set together with that of another) 80%
1.b ordinal approach ((the child verbalizes count and the last number uttered is associated with the number of objects) 87%. This is the most commonly used method to count and that comes closest to the initial verification of the skills of the counting. The increase in this percentage, compared to the initial value, is probably due to the many activities that occurred between the two recordings, and also to the growth of the children in this range.
1.c Geometric approach (accounts related to measurements of distances in everyday life) 27%
1.d recursive approach (in our case, use of sequences with changes of color) 31%
The cardinal approach is therefore the one that gave the best results in this group of children.

2.2 Children with autism

The same method used with children with dyscalculia was then tested with children with autism between the ages of 8 and 10 years. All children examined had serious difficulties in counting. In this case the sample to be examined does not allow us to make a statistical report, however, we report the data collected on a sample of 15 children.

- Cardinal approach(comparison of the numbers of a set together with that of another) 73%
- Ordinal approach 6%
- Geometric approach (0%)
- Recursive approach (53%)

2.3 Total agenesis of the corpus callosum (ACC symptomatic)

The two children with agenesis of the corpus callosum ACC surveyed have not used in a satisfactory way or the geometric method nor recursive. Both children had difficulty linking to the figure number (symbol). An extremely creative visual method made it possible to overcome this barrier. The figure shows, for example, a fanciful representation of the number one.

Fig.1.The number 1 drawn by a child with ACC activity after the recognition of the shape of the numbers in the objects and people in the life of every day.

In the following table we summarize the data described above. It is clear that there is a preferable approach over another

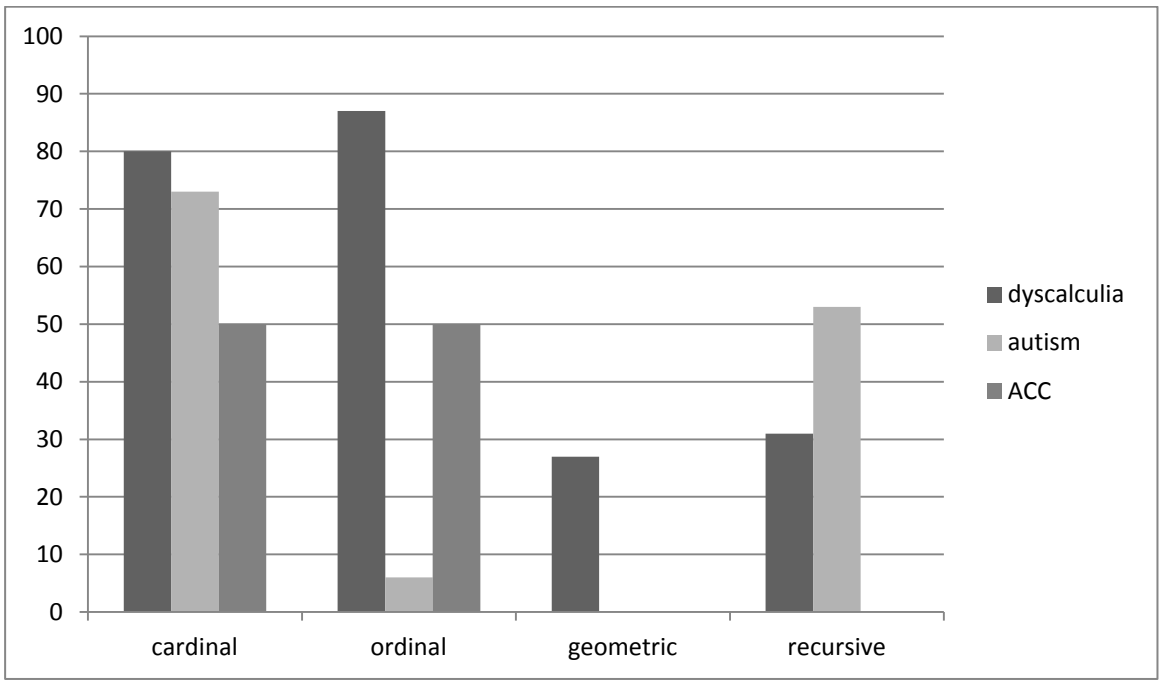

Table.1 Percentages of boys and girls with various disabilities who profitably uses different approaches to counting

3. Tessellation in primary school with classes attended by children with disabilities

The activity that we now describe was proposed within the school into four classes attended by some children with dyscalculia and autism. The idea was to help bring the geometry and the transition from line to plane figure through a game shared by all the pupils. It 'was set up in the four classes a soft corner and colored with soft geometric figures with different shapes to allow the play of tessellation.
During a structured activity has brought children to play with lentils creating lines and dots. Spontaneously into three classes out of four children have associated with that activity tessellation made with lentils, surrounding with lentils different plane figures. The international language of mathematics eliminates the barriers of those who have language difficulties, but also for those who speak other mother tongue.

Fig.2. an 8 year old autistic child creates the outline of a triangle with lentils

In this as in other cases [2], our effort is aimed at identifying activities related to mathematics, logic and geometry that may represent a common point for all the boys and girls of the class with or without disabilities. In this context the care in the space and the choice of materials are as important as to the multiplicity of methods and approaches.
At the end as said Loris Malaguzzi (1920-1994), Italian early childhood education specialist. :
"The Hundred Languages
No way. The hundred is there.
The child
is made of one hundred.
The child has
a hundred languages
a hundred hands
a hundred thoughts
a hundred ways of thinking
of playing, of speaking.
(…) The child has
a hundred languages
(and a hundred hundred hundred more)
but they steal ninety-nine.
The school and the culture
separate the head from the body.(…)"
We believe that especially in mathematics is essential to propose always a variety of methods and approaches.

References

[1] Loris Malaguzzi, I cento linguaggi dei bambini, Reggio Children
[2] Lara Albanese, Tutti i Numeri del Mondo, edizioni Sinnos 2013 ISBN: 8876092463