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## Brain training for dyscalculic children

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## Maths at the hospital school

Mathematics is a subject that affects each one of us in our daily lives. In every society, Mathematics has a part to play.

Even, in our early years we deal with Mathematical problems. For example, small children learn to handle geometric shapes in different toys, i.e. toy boxes and it continues later when you play with toys in the nursery school.

When children start school they have lessons in Maths. and they learn to read a clock and a timetable.

Some older pupils find it difficult to understand Maths at Junior High School. They can experience great difficulties understanding the concepts that their teachers are trying to teach. Depending on their culture and the language they speak, they may not recognise the problem they wish to solve. Some parents cannot help their children with homework, because Maths as a subject and the way it is taught has changed considerably since they were at school and some just don't recognise it at all because they were taught in a foreign country.

Please, read the articles below and find out how some teachers teach maths in an interesting way. Maybe in this way we can share our practice and learn from each other.

Many questions remain and we have a lot to learn about best practice in the teaching of Maths. <sup>2</sup>

*Agneta Grunditz and the Board of HOPE*

1 Stigler, J. W. & Hiebert, J. (2009). The teaching Gap - The Best ideas from the World's Teachers for Improving Education in the Classroom, Free Press (London)

2 Bishop, A. J. (1988). Mathematics education in its cultural context. Educational Studies in Mathematics, 19(2), 179-191.

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the Board



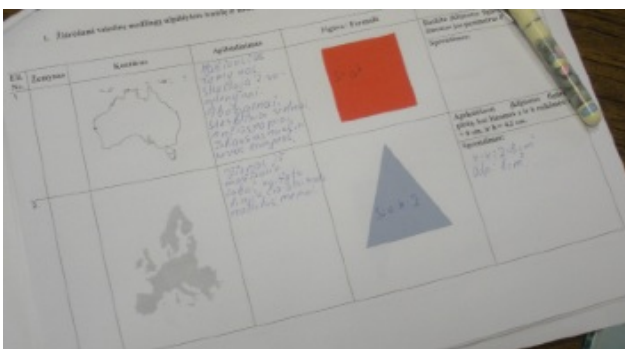
Clip courtesy of AGESO

## Schools in Hospital

# Teaching And Learning May Be Interesting

Mathematics is one of the main subjects taught in hospital schools of our Comprehensive Consulting Centre. Our teachers work in three hospital schools and do their best to help the learners to master all the subjects. They make subject plans according to the basic educational programs and group or individual plans considering students' knowledge, skills, interests, state of health and other factors. To make teaching and learning more efficient and interesting students are given to solve crosswords and puzzles or Math lessons are being integrated with other subjects, such as Science ("Proportion", "Length, Speed, Time") or Geography ("Scale") and others. Here is an example of a successfully integrated lesson given to a group of the 6-7th grade students by Math and Geography teachers. The lesson was about continents and geometrical shapes. The objectives were as follows: to develop students' creativity, imagination and intuition by integrating geographical knowledge about continents with mathematical practice of calculating areas. The integrated strand was finding a contoured geometrical shape for a continent. Acquiring the skills of memorizing continents and showing them on the map the students learned how to calculate areas of geometrical shapes, to fit formulas and literal expressions in such calculations. They watched videos representing continents, compared them with geometrical shapes and calculated areas. They acquired proper knowledge and improved their critical thinking, communication, learning to learn and creative skills.

*Genovaitė Petrauskiene*  
*Vilnius Jonas Lauzikas Comprehensive Centre, Lithuania*



1. The students were given task sheets for filling in the name of the continent and giving a short characteristic of it; from the given geometrical shapes they had to choose the shape which was most alike to the continent and make calculations of the area applying the given formulas.



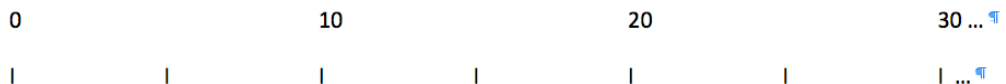
2. Some examples of carton models of different space bodies that were made together with students. The models are later being used at the lessons as visual aids.

## Mental number line

Only 3% of the children with dyscalculia have neurological problems (Gerster 2004). Therefore dyscalculia is mostly a developmental or even a methodological problem. As teachers in hospital schools, we face pupils with medical conditions who suffered from (motor) deprivations and stress. In children and adolescents with kidney diseases the verbal IQ was significantly higher than the performance IQ and the latter was also significantly lower as in a control group (Falger et al 2008). We all also know from our experience that lots of our young patients with chronic conditions show problems in geometry and often also in math. Therefore and because of having less time, hospital teachers have to provide efficient and effective (math) lessons.

In my opinion, the mental number representation needs to be trained very carefully as it is fundamental for math. (See also: "Brain Training for Dyscalculic Children" by Karin Kucian)

Counting starts as a "verse". The children know to say the words of the numbers in the correct order, later on they count things. Numbers start to represent an amount. Counting should be trained in steps of one, two, five and ten and backwards. As soon as the children know the digits, we can ask them to place numbers in order and on the number line (some call it "number ray" but as there are also negative numbers, I prefer number line):



*dyscalculia is mostly a developmental or even a methodological problem*

The developmental stage of the pupil defines the scaffolding that you provide (all numbers, only 0, 5, 10,... or only the tens or even only some marks, the start and the end numbers...).

The counting and the number placing should be exercised whenever you enlarge the number range (up to 100, 1000 etc.). Of course you enlarge also the steps. "Please continue: 10, 20, 30... 100" (or backwards: 100, 90, 80...) or even more challenging: "14, 24, 34,...".

Moser Opitz showed that lots of adolescents with problems in math struggle with sequences like: 176, 186, 196, 206,... (especially over the hundreds). They also show problems with doubling and dividing in half, segmenting numbers in parts:  $7521 = 7000 + 500 + 20 + 1$  and divisions.

I am very strict when it comes down to getting rid of solving additions and subtractions by counting ( $5 + 4 = 6, 7, 8, 9$ ) which in my opinion should happen before starting multiplication and needs lots of clever training. We use the "force of five", train the simultaneous perception, use the fingers for representations of amounts (only static) and split numbers. I offer two strategies for when they have to learn to add over ten: Either the pupils use the doubling and their neighbour additions:  $7 + 7 = 14 \Rightarrow 7 + 8 = 15$  and  $7 + 6 = 13$  or split numbers:  $5 + 7 = 5 + 5 + 2 = 12$ .

Clever, encouraging and enough training is essential and while achieving the milestones of (math) development, our challenged little patients can improve their self-esteem and self-efficacy believes.

Please contact me for the list of the (mentioned) literature: [christine.walser /at/ kispi.uzh.ch](mailto:christine.walser@kispi.uzh.ch)

Christine Walser  
Hospital Teacher, Children's University Hospital Zurich, HOPE Committee Member for Switzerland

*We use the "force of five", train the simultaneous perception*

## Working with a diversity of children

*The teacher evaluates students' capacity to face requests*

In the Educational Centre Santa Faustina teachers have the opportunity to work with a diversity of children, including children with disabilities. Here come hospitalized children with health problems, with or without learning difficulties but also handicap children with real school problems. What makes them different to other children their age is the unique character of their illness. Differences we usually meet at most children with CES are sometimes so big that it is difficult for teachers to set up criteria for by comparing them to "classic" difficulties. That's why first step the teachers have to do is to recognize the deficiency in learning. There are different elements in mathematics which are real obstacle for students:

- learning the numeric symbols;
- set up numbers in rows
- the algorithm in the mathematics
- steps in solving an exercise.

The teacher evaluates students' capacity to face requests of a certain curriculum and establishes the personalized intervention program for each student.

So it appeals to three methods of representing mathematic concepts (arithmetic operation, natural numbers, fractions, unity measure, etc):

- the concrete method by using objects ( bricks, balls, pencils, small sticks, etc)
- the imaginative method which uses pictograms, graphics and other visual procedures CD, PC;
- the symbolist method which appeals mathematic symbols.

This method allows elaborating learning activities of the mathematic language. By a progressive transition form the concrete to the symbolic method, students will be able to learn according to their own requests. At the same time, the teachers not only achieve a cognitive acquisition for the student but an affective and behavioural acquisition.

The positive appreciation and rewards for each progress of the student have a big importance in growing students self esteem.

Visescu Tuta, Educational Centre Santa Faustina, Romania

<http://www.ixl.com/>



## Brain Training for Dyscalculic Children

### Research

Current theory indicates that the development of numerical cognition is based on early core abilities to process magnitudes ("number sense") and includes the acquisition of symbolic numbers (words, digits) as well as a spatial representation of numbers (mental number line) as important steps during preschool and primary school years (Dehaene, 1997; Kucian & Kaufmann, 2009; von Aster & Shalev, 2007). Growing evidence indicates that developmental impairments of number processing and calculation abilities are associated with atypical specialization of particular cortical regions mainly in the parietal and frontal lobes. Brain imaging studies point to differences in brain activation and brain morphometry (Kucian et al., 2006; Rotzer et al., 2008).

Since our brain is a highly plastic organ and able to change as a result of individual experience, specific training of number processing should lead to improvements in math ability accompanied by neuroplastic changes. The aim of our recent study (Kucian et al., 2011) was the development and evaluation of a computer-based training program to improve number representation in children with developmental dyscalculia, which is a specific impairment of number processing. The efficacy of the training was evaluated by neuropsychological tests and functional magnetic resonance imaging. Dyscalculic and control children trained during five weeks with our program, called "Rescue Calcularis". In general, both groups could benefit from the training indicated by (i) improved spatial representation of numbers and (ii) increased number of correctly solved arithmetical problems. After completion of the training, both groups showed reduced recruitment of mainly frontal brain regions which can be attributed to automatization of cognitive processes necessary for mathematical reasoning. Moreover, results point to a partial

working through  
the sense of  
shame, feeling  
the pressure to  
be always  
"adequate".

remediation of deficient brain activation in the parietal lobes in dyscalculics after consolidation of acquired and refined number representation. These results are promising and foster the importance of the understanding of neuronal effects of specific intervention in children with mathematical learning disabilities for the evaluation and construction of effective and suitable therapeutic material.

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## Committee members questionnaire

*Let's get together*

Using a new technology available from the forthcoming new hope website, we developed a Questionnaire for the Committee members to ask for their needs and availability to attend a special 2 days Committee meeting. Here are some results of general interest:

\* 23 Answers were collected; 13 CM are very much likely to attend such the meeting, 6 are likely to attend.

\* 7 CMs would like the meeting to take place on a Week-end; 7 during a working week. 6 of them next to the Amsterdam conference, 2 during a vacation.

Here's the most requested items for a discussion:

- N.
- 13 Good practices in Hospital teaching in Europe
- 10 How to setup an EU exchange programme
- 09 How to find new HOPE members
- 04 Communication with the HOPE Board
- 02 newsletter, Hope Statutes and IR, teamwork.

As we can see items connected to the teachers practical working life are predominant, while Association life is seen as an item of secondary importance (yet, it needs to be addressed as it would allow us to reach more objectives of the first area).

The board is working toward the organisation of a 2 days meeting which will be held before the Amsterdam conference (Monday 8<sup>th</sup> and Tuesday 9<sup>th</sup> October 2012), where the most requested items will be discussed. It will be then CMs responsibility to follow up the results with the national members of the association.

Michele Capurso, Hope Joint-President

## Next Hope conference – save the date!

### 8th HOPE-congress, Amsterdam, 9-13/10/2012.

Dear colleagues,

It seems far away but October 2012 is approaching very fast for us, as organizing committee, but also for you in your planning and preparations for the HOPE-congress.

Unfortunately our application for subsidy that we made (a lot of work) and sent in February to the Lifelong Learning Program "Comenius" has been rejected.

We cannot therefore offer you the same cheap congress-fee as the organization in Munich was able to. But on the other hand you can ask now yourself for financial support by contacting your national European agency and send in your request. You can find the addresses for these agencies on our HOPE-website and ask them for the deadline (do it in time). [www.hospitalteachers.eu/knowledgebank](http://www.hospitalteachers.eu/knowledgebank).

The organizing committee and all our Dutch colleagues are very enthusiastic about the congress in Amsterdam and we are all working very hard to make it an interesting and nice HOPE-congress for all of our European colleagues. The website [www.hopeinholland.eu](http://www.hopeinholland.eu) with a lot of valuable, interesting and nice information, will be online in October/November 2011. The congress-program will be published in January 2012, because we are very excited to show you what we already have organized for you and of course you need the congress program for your subsidy-application.

Our "call-for-papers and poster presentation" will be sent out in October/November 2011 through your committee-member and through the HOPE- and Congress websites with a deadline set to May 2012.

We are very honoured to organize this 8th HOPE-congress in Amsterdam. We hope to welcome all of you and we are looking forward to meet and greet you again or maybe for the first time.

Warm regards from all your Dutch colleagues by Michel Kleuters, Chairman of the organizing committee.



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