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'Let's visit Numberland'

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Welcome to our short trip to Numberland! I am very happy to be given the opportunity to present NL to you because I am very passionate about it since I have seen so many children getting so much out of it, also my own. So let us jump right on the bus to NL!

Chart 2 : 'Let's visit Numberland'

Numberland comes across as a very playful and imaginative concept. Nevertheless, it is packed with math coherences and information and it is very carefully designed according to modern findings on learning. There are proven effects not only on math skills but also on language.

'Numberland' is not a pure math programme. It wants to contribute to the overall development of a child and that includes language, emotionality, motivation, social skills, creativity, musicality, motor skills and so on.

So in daily play, NL aims at bringing the entire child (that is with body, mind and spirit) together with the entire matter which are all aspects of the numbers 0 to 10 and the numerals to 20. And there are so many aspects of what numbers stand for, how they are used and how children experience them.

To meet that challenge, ‚Let's visit Numberland' combines findings from brain research, developmental psychology, educational science with the didactics of mathematics.

NL is not a strict program but an open frame, a central theme, under which many different activities take place. It helps structuring and putting experiences from the working memory into the right place of the long-term memory.

Both children and teachers are encouraged to bring in own ideas. Popular and established math activities can be related to NL. The concept is flexible so it can be adapted to age brackets and individual needs.

Activities you offer anyway such as sports, creative work, music and singing, eating together, playing outside can pick up on NL.

„Numberland" can be a starting point for the further exploration of topics, for example in the context of number 2: pairs, opposites, symmetry.

Chart 3 : Building a solid bridge

This chart kind of illustrates what is relevant according to brain research, developmental psychology and pedagogics.

Basically, it is all about successfully building a solid, individual bridge to get from one side to the other: from the mathematical understanding of "1,2,many" we are born with …

… to the formal, abstract language of math we developed in our culture to describe and handle a vast number of things – in every day life, in school, in any profession. So solid knowledge is crucial, yet most math problems go back to a vague or wrong understanding of basic math.

There is also another aspect: Math and the mother language are the key subjects when a child enters school. Children are motivated and WANT to cope with the tasks they are given. This is of utmost importance for a child's self-esteem and his motivation to learn, also other subjects to come.

Brain research tells us about Associative Learning: The quality of what we learn depends on what is

already there! All experiences, knowledge, and – very important – emotions come in. Obviously, learning a very individual process because we all have our specific knowledge, experiences and emotional associations.

Any new information is judged on basis of these inner pictures and then embedded into the existing network. So the more dense this network developed in our early years, the better and easier we can learn later on.

We therefore need a surrounding that motivates and enables children to explore mathematical coherences on the basis of their existing knowledge and skills.

Funny enough: Our math understanding is located in different areas of our brain! No such math center that we can just fill! Some skills are located in our language center, others have to do with our orientation. All connected!

We can draw three conclusions from this:

1 Other skills also build parts of the bridge!

2 It is appropriate to provide many opportunities to approach a topic from different angles. Moving and music for example facilitate cognitive learning particularly well.

3 It motivates to put things into a context, to connect things to the children's world.

To get it right, in NL we take the children's perspective from their side of the bridge: How do they see the world? What do they understand, need and like?

Answers are given by **developmental psychology**.

A major point is that children have a highly emotional view. For a while, children regard everything around them as being alive (Table). Something or someone is either completely good or completely bad! Also anything magic strongly appeals to small children.

Something that arouses us emotionally – good or bad, we remember particularly well. The stronger the emotions, the more it burns into our long-term memory!

By the way, the same is true for places! We remember places particularly well, places where we experienced something, especially something that aroused us emotionally.

Now we combine all these findings and make the abstract numbers an emotional happening…

Chart 5 : Imagine a magic place

Imagine you are invited to a magic place called Numberland… where the numbers 1 to 10 live, each in an individual garden of Number Town. They are nice, living characters who invite the children to playfully explore math. Hodgeypodgey the cheeky goblin is very popular: Ever and again, he messes around, and the children get it right again. A nice fairy may help the children to sort things out again. There are tales to listen to, songs to sing, gardens to furnish and lots of games and activities. For example: 6 wants to draw a rainbow but in the beginning has only three colors…

This is the idea. Now we must transform this idea into a concrete, tangible setting.

Chart 6 : Number Town tourists

So let's meet some tourists in Number Town.

By the way: This is my daughter Tina (just turned 3) and this is my son Tom (about to turn 5). And it was because they were so completely absorbed by NL and got so much out of it back in 2004, that I dedicated myself to NL…

What you see here is Number Town: All elements of Number Town communicate math coherences in

one place.

The now very tangible numbers 1 to 10 live here: 3 has a triangular garden, 4 a square, 5 a pentagon and so on. 1 lives in a circle and 2 in an ellipse.

These are the houses. As of number 6, each house is a duplex: 5 + 1 (according to hands).

The gardens build a full circle and organizing, furnishing and playing with them allows experiencing all aspects of numbers and shapes. They are also the starting points for other activities.

Chart 7 : Number Lane : 0 to 10 (20)

We look at the gardens in a minute, but first we need a way to get in and out NL.

This is why we have Number Lane, going from 0 (not 1!) to 10 resp. 20.

By moving forward and backwards on Number Lane and playing numerous fun games on it, children become familiar with the ordinal aspect of the basic numbers. They experience addition and subtraction as well as successor and predecessor.

As you see here pebbles on the mats, Number Lane can also be used to combine ordinal and cardinal aspect.

The picture on the right shows that NL also works in other cultures.

Of course, such a number line is absolutely nothing new, but it is the idea for the children: playing on NLane in NLand – not just on any number line!

Chart 8 : Gardens full of math…

Now let's have a closer look at the gardens.

Gardens full of math…

Here we see some typical gardens as arranged by children aged 3 to 6 years:

The puppet animates the abstract numbers, communicating that numbers are something nice and lovable. She may tell a tale, help arranging her garden, or be part of role plays.

Four's house has of course a house number and four windows that the children closed with pegs. A number tower or chimney also depicts the number: Children learn to compose it in different ways and compare it with other towers.

The children collect various counters and all day material or toys and arrange them in the garden. They learn that it does not matter what a set consists of or how it is arranged: 4 is 4!

Also typical things: car, book, dinosaur

Same in this garden (3) (3 children of a Pre-K class in Texas) : slice of pizza, a triangle

But wait a minute! Imagine a toy cow: It is one cow, with two ears, two horns, four legs…!?

This is where cognition, language and social skills come in because there is obviously a lot to detect, discuss and decide! Children are strongly motivated to find out, discuss, and decide where to put an object.
The great thing is that all children can participate, no matter how well they know a language, as long as they understood the idea. And that is really easy. In fact, teachers do use NL deliberately to playfully teach language (also second language).

You can deliberately bring in something to elaborate on. Imagine beetles with their 6 legs. And imagine all the finger games, songs, active games and creative work on beetles, or collecting some beetles outside!

Chart 9 : Opening doors

You see, a whole world opens and you can go into really many directions – depending on your objectives and of course those of the children.

Music plays an important role here! Rhymes, music, and singing have highest value for children. We composed a refrain and songs for each number. Their beat and number of tones correspond to the number as well as the content does to our number tales. As everything in NL, they are an offer, no must. You may also bring in other songs or own stories.

Each visit to Numberland can be the basis for lots of activities around the specific ‚number of the week': Fun games, more related songs or rhymes, designing or moulding, exploring specific questions, sports or outdoor activities...

So much for our tiny short trip to Numberland.

Charts 10 and 11 : Scientific findings on 'Numberland'

Let me finally show you findings from a research project carried out by Gerhard Friedrich and a school psychologist. Children between 3 to 6 years of age participated. Over 10 weeks, the project group went on a Numberland trip. Their visits to the numbers were accompanied by appropriate activities during the week and free play.

The red dots show how well children managed the tests on math relevant thinking before the 10 weeks; the green dots show the results after the 10 weeks. All children had to answer the same school relevant questions. Of course, the younger the children, the lower their initial score.

But you can see that within only ten weeks the children on average gained the mathematical competence and understanding they normally would have achieved only within one year!

The same was true for the language competence of the children - a highly important finding since language is the key to education.

The findings were also true for under-privileged children with partly very poor understanding of the German language. A second study from the University of Heidelberg confirmed our results.

Apart from that, consider the psychological aspect and support of basic math: In the world of math children find clear rules and orientation, something to rely on, something that is structured and is not volatile! Not to mention the inherent beauty of symmetry.

Chart 12 : Thank you

I hope I could bring the idea of Numberland across and as you see, our entire family including the cat is fond of Numberland...

As for me, I am curious whether and how Numberland could possibly be of value to other countries.

We have a first draft English version of Numberland (including songs on CD) so if you are interested in the concept, please do approach me if you would like a free sample.

We would be very happy to make Numberland available internationally. Any help is highly appreciated.

Thank you so much for your attention and have a wonderful time here in Germany!

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