Montessori

Children on the move ...

International Montessori Schools and Child Development Centres
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Visual-Spatial Intelligence

Inside: Intelligence expands • Visual-Spatial Intelligence • Tangible learning experiences in the Montessori classroom • The hands form the brain – Parent Infant Community and Toddler Community • Concrete experiences in Children's House • Three-dimensional thinking in Primary • Thinking critically in Secondary • Intelligences at home – The importance of play

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Intelligence expands

Isn't it amazing how children change and develop? The years go so quickly; we adults can sometimes hardly keep up. It seems not long ago that the children were sitting on the swing and suddenly they are 'sitting' for a theory exam and learning to drive a car.

This age span is present at the International Montessori School and it is beautiful to see how children's skills multiply, empathy becomes apparent, knowledge increases and critical thinking in relation to the big wide world evolves.

Intelligence is not a fixed entity; it cannot be measured and given a scale, since it is so complex. All-round intelligence depends on life experiences such as the challenges given, exposure to information, free play, freedom and limits, second language learning and much more.

Each experience provides an entry into the intellect. Traditionally it was thought that left-brain learning developed the intellect. Thanks to researchers such as Gardner, Goleman, Kotulak, Montessori, de Bono, Maher and many others we know now that that is only partly true.

To become successful in a complex world, a multifaceted intellect is necessary. The visual-spatial intellect is one of these entries into the personality that stimulates thinking and learning to see the world and its details from different points of view.

Visual-Spatial Intelligence

In early childhood, the visual spatial sensitivity is very well developed. This is necessary because other intelligences such as the linguistic intelligence is not yet in use.

A young child observes and touches the world. Based on these experiences, images are formed in the brain. Words naming these images develop later after regular repetition by family members.

The visual and spatial sensitivity can grow out into a major entry into the personality. It can constitute a special interest or learning mechanism that assists other skills to grow.

A person with a strong visual-spatial intellect believes what he/she sees. In some people a photographic memory can develop as a result. In general terms it is a person who can visualise the world and it's connections in his/her mind. He/she has a good spatial awareness. The person is strong in estimating size, distance, and weight. They use statistics regularly, likes to work with maps and can find directions easily.

This person has a very good feeling of him/herself in relation to the outside world. Initially this can happen on a playground with swinging or hanging upside down. At a later stage this can happen in a car, driving from point A to B. The bodily-kinaesthetic intelligence is therefore closely related.

It is often said that visual-spatial people are artists. And some are, however this intelligence goes beyond just artistic endeavours. Visual-spatial people are often indeed creative, and this creativity can take many forms and shapes; it can be in relation to products, processes and strategies.

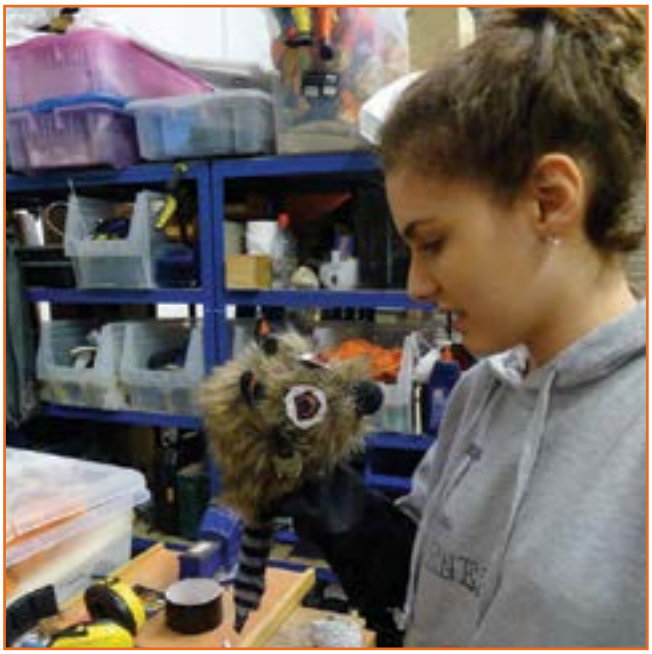
The effects of childhood on the future adult is amazing. In order for the visual-spatial intelligence to develop to it's fullest, children need many

opportunities. Free play is very important. Play in the real world, with logical freedoms and limits, actually influences the thinking of the future manager, designer and athlete of the year!

Strengths particular to this intelligence

People with a strong visual-spatial intelligence are:

- Aware of their surroundings
- Remembers places vividly,
- Often looks out of the window when in a car
- Artistic, fluid with ideas
- Visualise what they think and hear
- Creative, good with their hands
- Good at games such as chess, cards, puzzles
- Sense of form, shape and relationships – geometry
- Can often draw what they see or play what they hear on their guitar
- Develop an eye for photography
- Can analyse paintings and see more detail
- Good with directions, bus schedules, booking of trains/flights
- Good at interpreting statistics
- Uses metaphors in language
- Tend to look at the "big picture"



Possible careers

Being able to visualise data, processes and directions mentally affects results in many different occupations. A surgeon cannot do without it, nor can the car mechanic or the architect.

- Business analysts
- Performing and visual arts, music
- Design: fashion, interior, jewelry
- Town planning, engineers, cartographers, urbanism
- Architects, Construction industry
- Strategists, banking
- Marketing: graphic artists, designers
- Mechanics, technicians, computer industry
- Sports: football, hockey, horseback riding

Tangible learning experiences in the Montessori classroom

Intelligence is seated in the whole body. The brain is the control room, however not all intelligences 'sit' in the brain. Our hands, muscles, skin and senses are all part of this 'intelligence network' which is linked through the nervous system.

The senses are the sensors and feed information to the intelligence network. Therefore in the Montessori school, especially with the younger children, all senses are given work to do. Children learn in a very concrete environment.

In order to assist in the development of visual-spatial intelligence, children need to have the opportunity to work with their hands and incorporate their body. This body-mind connection is important, as it assists in the integration of knowledge. Children also need a level of free-thinking space. They need their own experiences to personally know concepts and also social contact to see others work and talk through concepts. This variation of freedom and necessary limits gives opportunities and guidance.

The hands form the brain - Parent Infant Community and Toddler Community

Visual-spatial intelligence begins to develop at birth. Initially baby's eyes can only focus on an object no further than 40 cm. away. This is mum's face and it is visible when being fed and held in mum's arms. The function is completely in service for bonding and feeling emotionally safe.

Two months later vision expands and baby can focus as far as light spots on the ceiling. From then on eyesight becomes an important sensor for the development of visual-spatial intelligence. Interesting mobiles and toys assist the eyes in learning to focus. During waking hours babies also like being surrounded by family members so they can see what is happening.

A couple of months later, objects on the floor enthuse the body to want to crawl towards them, and as such learn to gauge distance. Infants develop well when they spend time on a large mat on the floor. This gives the opportunity to start moving and to develop the necessary muscles. It also assists in developing motivation because the baby wants to get towards something; he/she has an aim in mind.

During the first year of life, the myelinisation process is taking place. This is a process of coating and insulating the neuro-pathways. This coating allows for the messages to go to the right place within the nervous system. This is a natural process, and can be stimulated by giving the infant the

appropriate experiences. For this purpose, infants should not be contained too much in 'containers' such as Maxi-cosies, swings, inclined chairs and body shaped bathtubs. Baby's body needs space. The muscles, hands, feet and all their senses need to work together to develop towards the next stage.

An example of the connection of the bodily-kinaesthetic and visual-spatial intelligence is the learning to sit stage. When a baby is too often in a Maxi-cosy, the muscles do not get enough practise and do not get stronger, which delays the child in being able to sit by himself. Together with sitting develops the eye-hand coordination. Once the child can sit, the hands become free and the body position changes. This allows for further development with activities such as putting balls in a hole and cubes in a box. By simply taking away the Maxi-cosi and allowing for free movement on a mat, one also influences the progress of the development of other intelligences.

The myelinisation process slowly continues towards all extremities and is completed one day. Then baby walks and becomes a toddler. Suddenly they are upright and the hands are completely free, resulting in needing to touch everything! The hands become the tools of the brain. A child appropriate concrete environment is needed here as can be seen in the Toddler Community. The home can also be adapted accordingly, so that the toddler receives many

experiences that make him/her feel worthwhile as a contributing member of the group.

Busy hands form many different concepts; shape, distance, weight, dimension, colour, smell and sound are all explored and form the basics within the visual-spatial intellect. Initially the toddler experiences all concepts unconsciously and on a concrete level.

Apart from the sensorial materials, also practical life is giving information to the visual-spatial intellect. The child loves doing real life activities as he sees Mum and Dad doing. The young child can wash the dishes in a tiny sink and place them to dry on the rack. Due to the fact that the dishes are breakable, the child adjusts speed in action, sideward movements and force. Those are the skills that are related to the visual-spatial intellect. Now compare this with a plastic play kitchen and the adult will find that all objects end up on the floor, showing that no intricate development has taken place.

Dressing, undressing, potty learning and putting slippers and boots on, seem to be just logistics, but are not at this age. This changing routine includes many visual-spatial activities and therefore needs its time and attention dedicated to it. An adapted environment with objects such as a very small toilet, low mirrors and a bootjack assist in mind and body becoming integrated.

'Don't touch', is something one would like to say in the home environment sometimes. But should one need to say this regularly, then it is time to adjust the environment to the child and not the child to the environment. The home should always contain certain objects that are not to touch, this is of course also an important concept to learn. However, the child needs to have the opportunity to do plenty of real life experiences to develop the different intellects.

Concrete experiences in Children's House

When walking into a Children's House, one sees immediately the beautifully coloured manipulative materials and children focussed on their activities. Young children have an innate urge to work with their hands; this is built in by nature so that the experiences can influence the formation of the neuro-network. The most intense learning period from a brain development point of view is during the first six years of life. It is important to use this time wisely.

Every now and then the discussion surfaces on the need of having computers in preschools. When one looks at this question from a child development point of view, it never needs to be asked again; the answer is a clear negative. The child is integrating mind and body and, by means of their life experiences, builds up their foundation for understanding the world. This is done unconsciously and through the brain's absorptive capacity. Such a period of intent learning will never

come again, so it must be used to the utmost and not wasted behind a screen. Also, screen related activities mostly develop intrapersonal intelligence since the child is doing it by him/herself. However from age three onwards, it is the time in the child's

life to develop the opposite, they are consciously becoming aware of the needs of others and start developing the interpersonal intelligence. So the child simply needs real activities in a real world with other people.

The Children's House offers a range of sensorial materials that deal with colour, shape, size, weight, smell and sound. These materials relate to the different senses and make the functioning of these important sensors conscious. Together with the sensorial experiences, the child learns the vocabulary that will help in describing the world around them as they are discovering it. It will also help in categorising new information. A categorised mind can easily incorporate additional information.

Sensorial observations form the base of sensorial awareness. When this happens together with movement of the hands and the body as a whole, it becomes spatial awareness. Knowing where one is in space is the basis for concentration. As we see with ADHD, children who have difficulty controlling their body in space, also have great difficulty on focussing on specific topics. Therefore sitting still is not an option for this age children. They need to be actively engaged in appropriate activities that meet their developmental needs. The adult, directress, is needed as a guide and is there to set appropriate limits. These limits are related to how one relates to others and how to work with the materials. Limits fine-tune children's behaviour and assist in the development of logical thinking.

The visual spatial intelligence appears in all the work Children's House children do. Maths is intricately designed with beads, cubes, stamps, rods and 'empty spaces' representing zero. Thus helping students to become able to visualise abstract concepts.

Within language children start to learn letters by means of sandpaper traceable cursive letters. Once they know about 70%, they move on to the movable alphabet and use this to construct words. Through this work, they suddenly realise they can read what they have placed on the mat! This sensorial approach prevents dyslectic tendencies

from developing, since the child uses the different senses to learn to read and write. The motor memory developed when tracing and placing letters, before actually reading and writing them is a wonderful example on how skills can develop stress-free when the different intellects are involved during the learning process.

Three-dimensional thinking in Primary

At Primary age the art of imagination develops based upon the concrete experiences that the child had in the first six years of life. The hands gave information to the brain about the external world, which created a network of neuro-pathways during the early years. The network can now categorise information and has therefore matured to a new level. More abstract relationships can be made which is the base of imagination.

Due to this ability children in Primary are interested in so much! In order to relate to this sensitivity, the curriculum needs to be expansive. Traditionally the first years of Primary are dedicated to learning to read and write in a systematic way without paying attention to the interest of the children. But they want to know more about the world; volcanoes, dinosaurs, planets and marine life are fascinating to them. At this age one can see the benefits of a well functioning visual-spatial intellect already. They can

build upon their concrete experiences and study continents they have never seen before because they can visualise dry sand as it is on the Nullarbor Plaines in Australia or slimy creatures living at the bottom of the sea. Simultaneously the visual-spatial intelligence continues to develop because the environment is full of three-dimensional objects, maquettes made by the children, maps and charts within all subject areas.

Maths is a perfect example. The child starts doing the mathematical operations initially very concretely with golden coloured beads. Each bead can be counted and quantities can be verified. This is followed up with the concept that colour holds a value and becomes more abstract when they learn that also position holds a value. This done with a large set of Montessori math material that assists the child in moving from very concrete to abstract understanding of the concepts. This is a joined effort where the mathematical intelligence is aided by the visual-spatial intelligence. The big advantage is that very few students build a block or dislike to math. They develop an abstract visualization of math problems, which benefits them from needing to learn concepts by heart.

Also other subjects enthuse for different intelligences to work together in cooperation with the visual intelligence. Geographical understanding starts at a static level learning topography by means of concrete puzzle maps. The knob of each puzzle piece is actually the location of the capital city. So France is held at Paris, thus giving linguistic information to the motor and visual-spatial memory. In Primary, with the help of imagination it becomes dynamic geography. The whole universe is studied, moving from the whole to the details, thereby arousing interest, wonder and curiosity.

Students move through topics such as features of the earth, the sun and the earth discussing relationships, time zones, climatic zones, the work of air, the work of water and human interdependencies. The outcome of this is beautiful. By means of charts, timelines, experiments, maps, artwork and many more visual items, students realise that humankind is interrelated with nature and with each other. They learn to see life three-dimensionally in that one needs to look at things from different points of view before coming to a conclusion or before believing what may be said in popular media!

Thinking critically in Secondary

IB Middle Years Programme and Diploma Programme

The development of multifaceted thinking as described in the Primary section leads to an important factor in older students—the ability to think critically. This is a skill that relies on combining abilities from different intelligences; should one not have developed mathematical intelligence or spatial awareness though the visual-spatial intelligence then this clearly influences one's opinions and decision making process.

Brian Bethune, author of 'Why Hockey is the Smartest Game', defines spatial intelligence as:

- The ability to grasp a changing whole and anticipate its next stage
- The ability to make quick decisions
- To see the relationships in a fast-changing array
- To understand the consequences

Sports players absolutely need visual-spatial intelligence in combination with bodily-kinesthetic intelligence. Hockey and football players need to calculate the exact angle to shoot a ball, horseback riders need to gauge the height and translate

this to angle and speed when jumping, cyclists understand how machines translate motion through space.

These skills are needed in life, both at a personal and professional level. Therefore continued integrated learning with a high component of development of integrated skills is necessary. This is not the time to put students in rectangular boxes with an interactive whiteboard at the front. Students need an open environment in which they need to use and continue to develop all the intelligences.

Visual-spatial intelligence surfaces in the different subjects. It is very much used in mathematics and also in humanities and the sciences. Let's take biology as an example. Even though the students learn very abstract material they also work with experiments, charts, and 3D models. As well, they go on outings and walk in nature in small groups to further their understanding of the botany they are studying. Nature walks also encourage the linguistic and interpersonal intelligence, with increased interaction with the teacher and with other students. Learning and the development of the multiple intelligences take place in a very integrated manner.

Art is also an interesting subject. Formerly thought as pure hobby or entertainment, however nowadays we know that it assists in the development of skills related to 3D thinking. The students use their imagination, which is the key driver in the development of innovative design processes and therefore influences creative thinking in general.

Technology has a strong influence on the visual-spatial intelligence. It deals with design and helps students setting up a process that allows them to find several solutions to a given task. When the task is product oriented, they make prototypes of these solutions and then, according to earlier set criteria, choose the best possible solution and put it in practice. This allows students to develop strategies for given problems and gives the message that a problem is not a hurdle but something to overcome.

Note-taking within the different subjects can be done by means of mind mapping. A person strong in visual-spatial intelligence will do this automatically. They will not itemise by bullet points but draw pictures and use key words written with coloured pens. Students who are very detailed minded and find it hard to see the relationships can use mind mapping as a visual tool.

Visual-spatial intelligence assists in processing, connecting and visualising data. It allows for big picture thinking. Being able to go from the big picture to the details and visa versa is an important part of the process in finding solutions. What starts with eye-hand coordination at six months old develops into becoming able to see the world as an integrated whole at the Diploma Programme level.

Intelligences at home
The importance of play

The body influences the mind. We all know that, yet, we often spend a lot more time on mind related activities than physical activities. For the adult the consequence might be an untrimmed body. For the child, the consequences run deeper.

Be aware of electronics. We are all talked into buying iPads, smart phones and computers. When children use them, it is mostly for entertainment, in other words, games. There is no denying that they learn something from this, however, it should not substitute being in the real world. Since iPads are only for the I, it limits in life experiences, as it is an entry mostly into the intrapersonal intelligence. The effect screen related activities have depends on the personality. Should the child have a predominant intrapersonal entry, then the negative effect doubles. Should the child have a predominant interpersonal intelligence, he/she will automatically limit the time with a screen as they want to play with others. (Until they become acquainted with Facebook). Time behind a screen unfortunately wastes the high potential in young people to develop and integrate all the intelligences.

There is a strong relationship between the bodily-kinesthetic intelligence and other intelligences. The mind needs the body to develop and understand. Also visual-spatial awareness develops initially through the body. In young children, the brain builds its neuro-network based upon kinesthetic experiences. It translates what the body and the hands do. Visual-spatial awareness is developing though navigation in space and by means of senses in full operation.

Play should become again a common factor in childhood. Adults remember building huts in the forest, jumping ditches, climbing trees, wandering the fields and playing in the snow. Whilst doing this, they lived in the moment, concentrated on their actions, communicated with each other and made necessary decisions. Play meant learning to live with personal, natural and social limits. It meant

that situations needed to be assessed, some 'risks' needed to be made: "will I jump or not?"

Living in a city provides limitations, but one can still create opportunities for these experiences:

- Taking friends to the park and allowing children to play all afternoon
- Play outdoors by themselves in the backyard
- Invite neighbours or friends and play together (no videos allowed)
- Summer holidays full of exploration
- Summer camps that provide outdoor free play and nature exploration
- Skateboarding, rollerblading and cycling
- Football or badminton on the footpath or in that blocked street with all the road works
- Going to a horseriding camp/school
- Join the scouts, go on camps to the Ardennes

These opportunities provide a level of freedom and an arena where many mental capacities are built. Child development does not completely depend on us adults. The child also has an internal compass. Reviving play in nature would be a great asset to childhood and harmonious development.

By Annie R. Hoekstra – de Roos

Good books:

- Edward de Bono, *Lateral Thinking* -1970
- Frank Wilson, *The Hand* – 1998
- Gardner Howard, *Multiple Intelligences* – 1993
- Gardner Howard, *Creating Minds* – 1993
- John Dewey, *Experience and Education* – 1938
- Maria Montessori, *Psico Aritmetica* – 1934
- Richard Louv, *Last Child in the Woods* – 2008

Good Googles:

- www.work.chron.com/jobs-related-spatial-intelligences-8847.html
- www.2 macleans.ca/2011/09/27/why-hockey-is-the-smartest-game-in-the-world
- http://onlinelibrary.wiley.com/doi/10.1111/j.1751-228X.2010.01089.x/abstract; Newcombe Nora S and Andrea Frick (2010). *Early Education for Spatial Intelligence: Why, What, and How*