KÄRLEKSLJ USET

When children meet light

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Abstract

Small children are fascinated by light and like to play with it. As lighting designers we should be aware of this natural enthusiasm and take advantage of it. Introducing the children to light carefully and providing them with lighting design that meets them, we have the chance to advance the children’s interest so that it can develop to a high sensitivity to light until adulthood.

In my thesis I present the light project that took place in many Swedish kindergartens in the past few years and that was started to introduce the children to light. I approached the topic by researching about the pedagogy the project is based on and analyzing the activities that it contains. By a vivid dialog with the kindergarten teachers, my own observation of the children and the study of documentation material from the kindergarten I got to know about the children’s relation and approach to light. Using this knowledge I was able to define some important factors to follow designing light for children. One of those factors is the aim to offer an open, flexible and variable lighting solution creating an environment that encourages the children to control and to adjust the lighting. Another factor is the ambition to make lighting design that encourages the children to find the perfect lighting situation on their own. Furthermore should the kindergarten be a place, where it is allowed to play with light and where light plays a major part in the children’s daily routines.
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Introduction

From the experiences with my own child I noticed how interested children are in light. I think there is no one-year old that doesn't enjoy playing with the light switch, turning lamps on and off. Light and darkness is a big topic already for very young children and the word “lamp” or “light” is one of the first words children learn to say. Children want to experiment with light but are often stopped. Unfortunately there is no space to let them play with light as they can play with water or sand. It's either the lamp that can be broken or the candle that can burn which makes it difficult to let them make their own experiences with this phenomenon.

Therefore I got very curious when I first heard about a light project many swedish kindergartens were involved in at that time. It is a project that should help the children to build up a relation to light and make them sensitive to it. The project evolved out of the Reggio pedagogy, a pedagogy that stands for a very democratic approach in the education of small children. Even though I didn’t know anything about that pedagogy nor about the details of the project work, I got the feeling, that this light project, together with its roots and its results, would help me to find out what is important designing light for children. I started to research about Reggio Emilia and about the light project’s activities and got to know how it is when children meet light.

![Image of a child playing with light](pic 4.1)
Methodology

The base for this thesis was the light project that was initiated by the Reggio Emilia Institute and took part in several kindergartens in Sweden for the past three years. I started out to research about the Reggio Emilia Pedagogy the project is based on and analyzed the activities that the project contains. Thru a vivid dialog with the teachers, my own observation of the children involved in this project’s activities and the study of documentation on the kindergarten’s “speaking walls” I got to know about the children’s relation and approach to light. This knowledge I tried to translate into an approach to lighting design for children focusing on light becoming part of the children’s daily routines, the play with light and the daylight design.
The pedagogy
Reggio Emilia and Loris Malaguzzi

After the end of WWII in spring 1945 the inhabitants of the small village Villa Cella next to the north Italian city Reggio Emilia found a tank and some guns that the Germans had left behind. They sold everything on the black market and decided to use the money to build up their own nursery, the so called “asilo del populo”. They build up everything with their own man-power in the spare time they had during the weekends or nights. Since this form of parents’ initiative was the first one in Italy without any examples to follow there was a big discussion about the approach in education which should be practiced in this people’s nursery. The goal for this nursery was to escape from the routes of fascism and depression and to develop a democratic and positive approach in child education. One of the people who were involved in this project was Loris Malaguzzi.

Already a few days after the construction work had started the young teacher and psychologist also living in that area had heard about this project and came by bike to see it. Fascinated of the people’s power and resolution he decided immediately to become part of the project providing the community with his knowledge and documenting the process of construction. With his help arose a clear vision for the kindergarten: “it should be the centre of communication and dialog and bring together what was separated before: the child, the family and the surrounding.” (Malaguzzi)

Loris Malaguzzi was born the 23rd of February 1920 in Corregio, close to the north Italian city Reggio Emilia. After his studies of pedagogy he was working as a primary school teacher. 1960, fifteen years after he had founded the people’s nursery together with the dedicated citizens of Villa Cella, he opened a centre for disabled children. 1970-1985 he was the coordinator for education in early childhood for the municipal nurseries and kindergartens in Reggio Emilia. Moreover he got involved with the children interests in and outside Italy. The exhibition “The hundred languages of children” which he initiated made him and the Reggio pedagogy world-famous. 1991 elected the “Newsweek” magazine the municipal nurseries of Reggio to the best preschool institution in the world. Loris Malaguzzi died in January 1994. He understood himself as “agitator in the matter of childhood”. “Agitators are disturbing the citizens’ peace, they want to stir up and to show failures. Children can disturb us with their problems but especially with their abilities and their poetry.” (Malaguzzi)
The Reggio Approach

The Reggio approach was developed in the late 1960s and is still practiced in the local nurseries and kindergartens of Reggio Emilia. Even if Loris Malaguzzi participated a lot in the development, this very practical, experiential and experimental educational approach is still mainly a "joint project" of the city and its inhabitants. In Reggio pedagogy parenting is understood as a community task. Cardinal principles are a humanistic idea of man and a democratic society concept. This means that the children are treated with respect, that they have their own rights and that they are taken very seriously. The daycare is jointly led by educators and parents, there is no hierarchy among the staff and the institution itself sees itself as a cultural focal point in the district. The image of the child that has been developed within the Reggio pedagogy is generally accepted in early childhood education today: “The child is a fully fledged human being with its own identity and culture and with a high degree of creativity and skills that want to be broadened constantly. The child is learning exploring independently and is expressing its experience in hundred languages.”

The Reggio teacher is the children’s companion and interlocutor. He observes them, takes up their themes and supports the childlike learning process by asking the right questions or providing the children with the right tools. “The common task education” is happening in dialogue with all involved parties which are the child, its family, the educators and the social environment. This guaranties a constant revision and development of the child’s education.

Some features of the Reggio pedagogy have particularly influenced early childhood education in general. First of all it is the method to work on different projects which often evolve out of the children’s own interest. A project can consist for example of the research about a special flower one of the children has heard about at home. The children start talking about this flower which causes the teacher to make a fieldtrip and to look for this flower in its natural environment. The children collect the flowers to be able to study them back in the kindergarten. Drawing the flowers, the children learn to really see them in details. In the following days the flower will change its appearance which makes the children think about its biology. Why does it change? Does it die? How is it born? The teacher encourages the children to draw the flower again and again in different stages and shapes and notices how the children get to know this special flower better and better.

The teachers are very open-minded and sensitive to the children’s thoughts and use every spark of interest to give the children the possibility to find out by letting them proceed in a scientific manner.
In the projects the kids are working in groups. In this way they are able to ex-
change their thoughts and to learn from each other. It is easier for a child to learn from another child than from an adult because the explanations and instructions are on the same level. The children are thinking in the same way and can explain in a much simpler way than a grown-up would be able to.

Besides the friend as a teacher there's the environment that is supposed to work as a pedagogue. The space the children are in should inspire them and make them think.

The materials in this environment are often materials which are not made for children, which is part of the mentality about taking the children serious. By allowing them to play with things that are no toys, they are given the responsibility to handle those things in a careful and responsible way. Since this is possible only to a certain grade the children are divided into age-specific groups and connected to a age-specific environment. In addition there are neutral spaces where different aged children interact with each other and can learn from each other.
Invece il cento c’è

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. A hundred always a hundred ways of listening, of marveling, of loving, a hundred joys for singing and understanding, a hundred worlds to discover, a hundred worlds to invent, a hundred worlds to dream. The child has a hundred languages (and a hundred hundred hundred more) but they steal ninety-nine.

They tell the child: to think without hands, to do without head, to listen and not to speak, to understand without joy, to love and to marvel only at Easter and at Christmas. They tell the child: to discover the world already there and of the hundred they steal ninety-nine. They tell the child: that work and play, reality and fantasy, science and imagination, sky and earth, reason and dream are things that do not belong together. And thus they tell the child that the hundred is not there.

The child says: No way. The hundred is there.

Loris Malaguzzi, 1985 (translated by Lella Gandini)
The light project
The light project

In February 2006 the Loris Malaguzzi International Centre was opened in Reggio Emilia. The centre is based on the idea of Loris Malaguzzi and is supposed to "create opportunities to increase dialogue around the culture of childhood based on respecting each child's identity, rights and potential." 4

A part of this centre is the Ray of light Atelier. It is not a museum but an atelier, "a place where hands and head can work together." 5

It is an environment offering children and teenager from two to eighteen years the opportunity to experience some of the qualities of light. Light has been a big topic within the Reggio Pedagogy in Italy already since the eighties. Out of the opening of this centre evolved the idea at the Reggio Emilia Institute in Stockholm to start the light project to Sweden. Several kindergartens in the whole country started to work with light more or less intense between 2006 and 2009. The light project was started with the goal to "explore and deepen the understanding of children's relationship to the phenomenon and concept LIGHT." 6

Every kindergarten involved in the light project approached the topic in a different way and dealt with light according to the groups unique profile.

For my thesis I got in contact with Förskolan Skogsglåntan in Skarpnäck, a kindergarten that was participating in this project. In several study visits at this kindergarten I got the chance to collect information in different ways. The widest source of information for me were the kindergartens "speaking walls" where all the work done by the children was displayed together with the teacher's explanations and photographs. Taking pictures of all that material made me able to follow all the activities the group was involved in during the project. Furthermore I got the possibility to take part in one of the activities by accompanying the group on their light walk. There I got a lot of unfiltered information directly from the children. The third very important way of gathering information was the vivid dialog with the teachers of this kindergarten. All this knowledge combined with the research about the Reggio Pedagogy gave me a lot of material about experiences that have been made with children in connection to light.
The activities within the light project

Plantation
At the kindergarten where I was studying about the light project the group was working mainly with daylight. The children are supposed to get to know about the effects of daylight on the surrounding. The research is made on plants. The children plant peas, potatoes or the like in glass bowls and place them in positions with diverse daylight conditions in the kindergarten. After this preparation they observe how the plants are developing over- and underground. Every day they look after changes and watch the roots spread out and the leaves grow. The development of the plants is documented accurately with drawings and paintings of the plants in different stages and the results are discussed. Experiments are made creating extreme conditions which illustrate the effects of daylight very clearly. When I visited the kindergarten for the first time I met a group of children sitting around the table drawing a pea crop in a flowerpot. Next to that plant there was a shoe box. Another pea crop had been set in this box and covered with a lid. There was a small opening in the box's wall to let some light inside. The result was a plant that was not growing up but leaning to the side, stretching towards the light. This was not the first time the children were drawing those plants. They had been observing and studying them for a long time and they had given them names. The one is called the sad crook, the other one, the glad Melonia.
Light signals

By observing both the plants the children have planted but also the flowers and trees outside they have noticed that there is some kind of communication between the light and the plant. The children understand that the plant is reacting the light and they build up a theory: “The sun is speaking to the plants by sending them light signals. These light signals provoke that the plant can develop and transform.”

The following project illustrates the children’s understanding about the effects of daylight. The group’s task was to explain their own theory about “light signals” by transforming two chairs and letting them become light and plant.

The background for this project is a question which is discussed consistently in the group: What is the difference between light rays and light signals? “Light rays give heat and light and light signals ask the plant which colour it will be and they talk with the plants and the people and the animals...”
A dialog between the light and the plant

Folke: The light gives now yellow colour to the flower. It’s not really done yet; there’s still some white left.
Nikolas: The flower decides which colours it will get.
Arwin: No, both do that, the flower and the sun.

Plant: I want to have my colours as I always wished them to be.
Light: Yes, you can get them; just say which colours you wish.
Plant: I want to have a light ray of lemon flavour.
Light: No, I don’t have any lemon flavour left but you can get a little bit of love flavour.
Plant: Can I get a happy new ray from you?
Light: I am sending you a rain ray first, later I will send you a new and happy beam.
Plant: I am a night flower. Can I get a ray of moonlight so I sleep well tomorrow?
Light: Okay, but don’t sleep the whole day.

Marcello: One day a frog came jumping out to the sun and said: ‘I want to have some water’ and the sun said ‘I don’t have any rain.’ The sun’s friends are the clouds and the grass and the flowers.
In the dialog between the light and the plant it is very obvious that the children assume a strong reciprocal relation between light and nature. The sun is giving light signals of different kind but the plant is reacting to them and sending back signals to the sun that is affected by them for example by changing colours.

Sometimes though the sun hurts the plant or even makes it die. These to the children opposite effects of creating and destroying they process by building up a theory of different suns or different kinds of light.

The children explain what it is that makes the plants grow or fade using the established terms “new light” and “old light”.

Folke: Old light is stupid light and new light is nice light. The old light destroys the leave and makes that it gets dark. The new light makes that it gets lighter again...

The old light is so old that it cannot walk that much. It is outside only in the evenings when almost nobody is there.

The new light is mostly outside in the morning. It is much stronger than the old light.

The flower and the sun and the new light and the moon are sending signals to each other instead of talking. They can say: Grow flower! Come up! The old light is saying: Fade! Go down! Die!

Arwin: The sun is new light basically. Old light is also a kind of a sun but this one is a little bit nastier.

Teacher: Are there two suns?

Arwin: I am not sure about that. Folke has come up with that.
The speaking wall

The group had visited a big green house. The gardener had told them that there was a computer that controlled the climate inside the green house which fascinated the children a lot. Back in the kindergarten they got the task to create a light board. The light board served to bundle and present all their theories they had developed during the light project and was supposed to be one of the speaking walls in the kindergarten. The kids decided that they wanted to create a computer-controlled green house.

The board shows the different effects of light they have got to know illustrated by the children's different suns:

1. There is the art sun and the new sun
2. The flavour sun sends different flavours to the flowers. Lemon flavour, grape flavour, love flavour...
3. The colour sun sends different colours to the people and the plants.
4. The computer sun send light to the plants to make them grow.
5. The glad sun repairs the leaves.
6. The angry flash sun destroys the flowers and the leaves.
7. The moon sends darkness to the leaf so it becomes a shade leave.
8. The green house is computer-controlled.
The light walk

At least twice a week it is time to leave the kindergarten and to go on the light walk to see the world with “light eyes”. It is a walk on a path of a varying light situation. It starts out going under a big bridge which is carried by gigantic concrete pillars. The children notice their shadows on the pillars. We cross a street and go into the forest. It becomes shady and green; the light is softer. We walk thru the forest looking for leaves in different colours. “Why did the leaves change colour”, the teacher asks. Andre explains: “Now I would like to change colours, the leaves say to the colour-sun because it’s the season where all the leaves have to change colour. Then the colour-sun just does it.”

After a short walk we get to a scuttle in the ground which the children look inside every time they are passing by. When the lid is closed this is a dark box the group is using to experiment with the lack of light in nature. How do the leaves alter when we lay it into the dark box? What happens to an apple, what to a piece of wood? Is it the darkness that alters those things?

Just a few steps farther we reach a clearing with a midsummer pole in the middle to dance around and a bench to take a snack on. This is a light and open space where we can see the sky again. The children notice immediately that the swings have been removed from their frame and that a piece of the midsummer pole fell off. They remember that the sun usually stands over the midsummer pole but today we cannot see it. “Today the middle sun is here. The middle sun is the sun’s neighbour or its brother”, Svante explains.

There is a water paddle where the children lean over all together and look at their dark reflection. On the clearing adjoins a colony of summer cottages with small gardens one next to the other. There’s a lot of changing colours from all the flowers that the people have planted. After crossing this area we walk a few more steps thru the forest. There are a lot of leaves on the ground. The children collect light leaves and shade leaves and explain:
Melissa: In the shade leaves the light gets inside in a way that makes it shadily and leathery.
Moa: Sun leaves are yellow and grow where it’s sunny. Shade leaves hide behind other leaves.
Arwin: The dark ones are shade leaves, there’s shade on them. They feel comfortable in the shade, in the dark. Sun leaves are there where it’s light. They are green and yellow.

After getting out of the forest we cross the same street we walked under in the beginning of our path but this time we go over a huge bridge. It’s very bright and loud here. The cars that are coming towards us and passing under the bridge have their white headlamps on; when we look to the other side we can see their red rear lights departing from us. On the left side at the end of the bridge there is a bus depot. The buses are blinking while they are ranking. They are sending light signals to communicate with each other. We cross a wood side and reach the children’s “race track”. The goal is a bench on the top of the hill. The last piece of our walk leads through an open field with bright light and a feeling of vastness.

“This light walk is our source of information for the light project.” Gunilla and Marianne explain. The children go with wide opened eyes on this path and notice every change that has occurred since they have been here the last time. They talk about the different theories they have about light and eagerly fulfill the tasks the teacher gives them even though they have been doing them many times before. They love to go from one station to the other and to explain what they know about light. Sometimes the group goes the light walk looking on it with different eyes. This can be coloured filters the children are looking thru to see a pink, blue or yellow world. Sometimes they take a photometer with them. Then the light and the shadow turn into numbers. The children measure and compare. When they get back to the kindergarten they process what they have seen on the light walk. Sometimes they draw a map of the light walk, often they build the route. Svante och Kevin explain the light walk they have built:
We are going the light walk, we go to the midsummer pole and dance. We go over the bridge and see the cars. They are shining when it’s dark and light; they shine like reflectors so they see in the darkness. They turn on their light when they are parking; when they are driving in the darkness then they turn on their lamps. We are swinging and collecting leaves that are yellow and leaves that the sun has broken and so on. Then we go back to the kindergarten.

Building the passage is an important method to process and understand the impressions the group has gotten from the light walk.
**Projection**

The overhead projector is used as one tool to enhance the play with light and shadow. The children place different objects on the projection platform and achieve a projection on the screen. The choice of the objects decides about the character of the projection which invites the children to experiment with colour transparency, translucency and different shapes. The objects placed on the projection platform are produced by the children especially for this purpose, collected outdoor or found in the children’s daily surrounding. This can be drawings, cut out characters, collected leaves or plants or just plastic parts or tissue pieces. These objects are used to create different scenes and plots. Light and the children’s fantasy let a story evolve on the screen, the spectacle starts.

The play with the overhead projector leaves a lot of room for creativity. The device serves as an invitation to let the children’s imagination run wild. The more creative and innovative they are by placing the objects on the projecting platform the greater is the surprise for themselves how the projection turns out. The stimulation to achieve a new scene or to develop the old one lets their creativity grow.

A very interesting feature about the use of the overhead projector is the change of scale. The child creates a scene in a small scale just as it would paint it on a sheet of paper. Through the projection the scene grows to life-size on the screen. The enlargement of the scale makes the story become more real and responsive to the children. It is easier for them to follow the story and it is exiting to see the light performance fill out the room.
The play with the overhead projector encourages the children to respond to each other. Like in the puppet theatre there’s room for the spectator’s role in the plot. The projection can become big enough to provide enough room for the children to be a part of the play. The scenery arranged on the projection platform and a child standing in front of the screen can cooperate and the spectators can become part of the story. An interaction evolves and the role of the director and the spectator is no longer defined.

The play with the overhead projector is very variable. The devise can be used of one single child to experiment with shapes colours and translucency of different materials that give different effects on the screen but it can also serve as an interaction platform between two or three children, where one part is arranging the picture in the small scale and the other part is responding to it and completing it in the big scale. In the light project this light play was often applied by simulating the dialog between the sun and the plant. The sun played by the child arranging the projection was sending light signals to the plant that was played by a child standing in front of the screen and reacting to the signals.

The overhead projector is a very easily handled device which therefore deserves to be called a light toy. It is easy to switch on and off and the adjustments which can be made to the projection are all mechanically variable and easy to achieve. It is no problem for a four-year-old to play with the overhead projector without supervision, once it has been introduced to the work with this device. The overhead projector is no device that has been used exclusively for the light project but a familiar tool that is an inherent part within the Reggio pedagogy.
Backlighting

The light table is a source of pure light. The light is not reflected but is shining in itself. The light is spread over a horizontal surface that can be touched and explored. Within the light project the light table is used in different ways. A scientific way to use the light table is to place plants on the surface to be examined or leaves to be screened. The children get to know about the physiology of the plants and understand that there is more than just the visible surface. They understand that light can do more than just illuminate. At the light table they experience how light can go through the material to x-ray the objects. The light table is also used to get to know about colours. Laying for example different leaves on the light table which all seem to be brown, the light shining through the leaves tells us more about their true colour. It makes old things seem fresh again and revives the colours. Backlighting the leaves reminds me on wetting grey matt stones. As the water lets the pebble shine in an unexpected colouring, the light reveals the true colour of the leaves.

But the light table is also used for experiments with translucency and colour mixing. By laying translucent materials in different colours over each other the children learn about colour addition and make experiments with overlaying different forms and patterns. These experiences made with help of light are pursued later with paint on paper. In this way the light table is a toy that makes the children think. It starts a scientific way of finding answers to questions that occur while playing with light. They begin to see because there’s light. Light makes them understand and makes them want to get to know more.
Another way to use the light table that fascinates the children is to use it in combination with a sand tray. The sand is placed on a tray with a transparent bottom and the tray is placed on the light table. Shifting the sand the children make traces into the thin sand layer. This can be done with fingers as well as with a brush or a stick.

An alternative to the sand tray is a sheet of paper placed on the light table and a puncher. By punching holes into the paper lines and pattern evolve.

In both methods light becomes the ink and makes light pictures evolve. This method of drawing by taking material away instead of adding something to it is a new experience for the children. They get the feeling to draw with light which they perceive as a magical way of creating pictures.
Summing up the light project

Analyzing the activities it became very clear that the light project had a great impact on the children. The children have gotten a knowledge about the basic principles for lighting. They have learned about the relation of light and material, about translucency and colour-mixing as well as about colour addition and the light spectrum. They have become very confident about their knowledge. They can translate it into their own languages proudly presenting their theories in their different activities. The children are aware of the great impact of light. They know that daylight can influence nature but they also know how electric light can project, go thru or change the appearance of materials or colours. They are aware that it's their own choice to use light in all its different facets and they know how much they can do with light themselves.

Furthermore the children have developed a high sensitivity to light. They have been “trained” to see the world with light eyes looking for the effects and the variety of light. But the most important in my opinion is the relation, the kids have built up to light. That becomes obvious when they show in their pictures how light and nature are affecting each other reciprocally. The children have understood that light affects THEM as well and that THEY can affect light.
Interview with Gunilla Pettersson and Marianne Strömberg

Gunilla and Marianne are teachers at the Förskolan Skogsgläntan in Skarpnäck/Stockholm. Together with a group of children and the art teacher Karin Furness they have been working on the light project for the last three years. Now after the project is closed I met them and asked about the experiences they have made.

In the Reggio Emilia Pedagogy it is common to work with different projects. Could you name some of the projects you were involved before? How do the topics of the projects evolve?

The first project was about stones and was going on through the school year of 2002/2003. From then on we were working with a different project every year. There was the tree project, the math project and the air project before we started to work on the light project. The projects usually evolve out of the children’s interest. I observe the children to find out what they are interested in. It is always subjects which are close to the children. They are very interested in their environment and the nature so it’s easy to find a topic just by listening to them and observing them. Then we provide a platform which makes it possible for the kids to learn about the things they are interested in.

How became light one of the topics?

With the light project it was different. This time it was not the children who chose the topic. In Italy they were working with light for a long time within the Reggio Emilia network. It was not only a big topic in the kindergartens but they had also built a light laboratory which schools and kindergartens could visit to experiment with light. Inspired of this work the Reggio Emilia Institute in Stockholm wanted to start a project in Sweden to investigate the children’s relation to light. Because we had very successfully worked with all the other projects before (we had even published two books) they asked us to participate in this project, which they called Ljuspunkten. The project was drafted for three years and there were five groups involved that should work with light in different ways and look on the children’s relation to light from different perspectives.

Which tools did you use within the project? Which topics did you discuss relating to light?

We used the overhead projector, the light table, prisms, filters, torches a photometer and we also had a camera obscura. We used plantation a lot, if one can call this a tool. We were mainly talking about the effects of daylight on nature. Out of this main topic many questions occurred, which initiated different experiments or study visits.

You were working with this project for a long time. How did you start and how did the project develop in these three years?

The main development was that the children took over after a while. In the beginning we had to lead them a lot, to provide them with tools or experiments that would spark their interest and keep them going. Later they showed us more and more the way
and the project became the children’s project. They invented their own theories and their own terms which they were using and developing all through the project.

Were “old and new light” and “light signals” some of these terms developed by the children? Could you explain them?

During one of our light walks we saw a little lighthouse that was standing in a window of one of the garden cottages. So I asked if someone knows what a lighthouse was. The children said that a lighthouse would blink to the boats sending them signals – light signals. When we came back to the kindergarten I took a torch and was flashing with it like sending a message in Morse: “Now we are going to have a snack.” The children found that very interesting and started to think about other light signals they knew till example in traffic. Soon they started to talk about the sun sending light signals to the plants to communicate with them. Then I wanted to know how these light signals look like and we started to draw and to paint them and from then on they became a constant part of the children’s theories. The terms “old and new light” evolved when we were working with nuts. The children took nuts with them from home and we were asking ourselves how the light is coming inside the nuts. The children were lighting up the nuts with the torches and when they started to use filters in different colours with the torches one child said: “Now there comes old light!” Then he changed the filter to a different colour and said: “Now it’s new light shining on the nut.” They continued using these terms even during their play with the overhead. The old light made the flower fade and the new light made it grow. Later they came up with terms like “happy light, sour light, angry light, flash light, love light…”

What does it mean in practice to work with small children on such a complex project as light? Can you describe your work?

I think the most important thing in such a project is to be open minded and not to expect anything. It was mostly the children who made something out of the project. We gave them the possibility to develop their perspective on light based on facts and fantasy and the rest came from them. You just have to let them fable and fantasize and you will find the truth. We had a boy who visited a Montessori kindergarten before he came to us where they have a rather instructional way of teaching. He was very quiet and didn’t take part in our discussions until one day he understood that there’s no right or wrong. He asked me: “So, I am allowed to make things up?” “Yes”, I said, “make things up!” That made the words just splutter out of him. Since that day we didn’t experience him as silent any longer.

In the beginning we couldn’t imagine how it will be to work on this project for three years. But since it was not only us but the children who defined the direction in which the project evolves it was always exciting surprising and educational, never boring or tiring.
Continuity is important working with children. Could you tell about the recurrent rituals in contrast to the special projects or experiments you made within the light project.

The most important ritual was the light walk. We had the walk two times a week and we got a lot of inspiration out of it for our project. It was always the same route and walking this path we were trying to see everything with “light eyes” as we said. The children got different tasks on the way and there was always something new we found out about light. Another ritual had to do with the weather. Every day we observed the sun and asked questions like: Where’s the sun right now? Where is it when we eat breakfast, where, when we eat lunch? How does it look like right now? We asked questions constantly, so that the topic was always present. Sometimes when the children didn’t have answers they got to draw or paint to find out. Homework was also a ritual which was necessary to find out about light conditions during the evening or night but also to keep the project alive even after they go home to their families.

The children you were working with were 2-5 years old. How did you deal with the topic light in the different age groups?

We have a subdivision in our group. The big children (4-5 years) are in one group then there is a group for the children 3-4 years old and then there are the small children (2-3 years) in the third group. In the beginning it was only me with the big kids, who were working with the light project, then the middle children got more and more interested in the things we were doing and so they got to join the project with Marianne. They just came in and learned from the big ones. They wanted to take part and the others wanted to tell them what they already knew. Often we did the same activities but apart of each other - every group in its own way. We both went the light walk till example but in separate groups. Then we met in the middle and we talked. Our small children didn’t deal as much with light as the others. The main thing they did was shadow dance and shadow theatre. But there is a kindergarten in Jönköping where a teacher working with small children also took part in the light project.

It was two one-year-old girls, she worked with and they didn’t use any material except pure light that came from the overhead projector. They gave them a lot of time and could observe how the small girls developed within the light and their own shadows.

What was the most interesting thing about light for the children?
What did they learn?
I think almost everything was interesting for them. They loved the light walk because that was the source where we got a lot of input from and because there was always something new to find out about light and they love to find out. They have been very eager all through the project.
Now and then there was a child that got a little bit tired of it. So, then we just waited a little bit without pushing him and he came back a few days later and wanted to participate again. Because we never got tired of asking questions, the children never got tired of looking for answers.

Today I asked Andre, who participated in the project last year what he liked and what he has learned about light. “Let me think”, he said. “I really liked to make all the different kinds of suns. Now I know that there is only one sun but it just looks different.”

How did the project influence the children? Did you recognize that the children changed according the handling of light through the project?

Their relation to daylight has developed through the project and changed a lot. We have not worked with light as a tool to create a certain atmosphere in the room and I am not sure if this strong relation they have towards daylight can be transferred on their attitude towards artificial light. They might have become a little bit more sensitive to certain lighting conditions inside a room but this would be far from their sensitivity they have developed to daylight.

Is there any ritual or tool from the light project you have kept and still are using in the group even though you are not working with light anymore?

The new project we are working on this year is nature. Since daylight is a very important part of nature we will continue talking a lot about light and its impact. So we still are planting different plants here and observing how they develop under different light conditions. We still have our walk but it is a different route under different aspects now.

We will continue working with the overhead projector which has always been an important tool for us and we will still be using the light table. I have learned so much about light during the last three years that I cannot just let the topic go.
Lighting design for children
Lighting design for children

As lighting designer am looking for a counterpart to the light project within the architecture for children. I believe that it is possible to create a similar sensitivity to light inside a room like the sensitivity to daylight that developed through the light project. For that reason I would like to raise some questions and make some suggestions for the lighting design of a kindergarten where light plays a major part in the children's daily routines and where the children are encouraged to adjust the lighting according to their needs and invited to play with light.

Ideally lighting design starts already in the building's very first planning stage thinking about a way to get daylight inside the rooms. The orientation of the building and the space division should result out of the linking of the users' activities and the daylight need. How much and which quality of daylight do the children need to eat lunch, to paint, to wash their hands or to sleep? Where do they want to have direct sunlight where is it disturbing them?

Another thing to take under consideration in a similar way is the view. The children should have the possibility to look outside and to observe things that are happening in nature even if they are inside. This is only possible if the openings are in an appropriate height otherwise all they can see is the sky.

A window that is placed not higher than 50 cm from the floor would allow even a one-year old to look outside. There are situations when daylight has to be obstructed or reduced. For that purpose a manually adjustable shading system that can be operated by the children, giving them the possibility to regulate the quality and amount of daylight themselves. This can be simply curtains in different colours, patterns and grade of translucency. These curtains should be arranged in layers behind each other to give the children the possibility to achieve different effects by gradually obstructing the daylight. It could also provide the opportunity to position different colours behind each other to get various colours of light inside the room. Furthermore it would be possible to block the daylight gradually or to achieve different effects with shadow patterns. By simply shifting the curtains the children get the possibility to play with daylight by using the window as a sort of natural light table but in the same way learn playfully to control daylight in order to achieve a comfortable lighting situation for themselves.
The interior of the kindergarten shouldn’t be lit evenly but should support the different functions of a space by different light setting. A room that is divided in zones as playing, reading, painting should also be divided in light zones. The appropriate lighting situation could help to define the function of the space in addition to the furniture. Creating for example a cozy reading or story telling area it would be appropriate, to choose a small protected space with warm light that can be directed to where it’s needed. In such an area it is possible to leave some darker corners to provide a relaxed atmosphere and to allow lighting effects. In a painting area in contrast, it would be necessary to have a light source with a good colour rendering and a positioning of the luminaries that light up the working area evenly. For light being an important factor of the children’s daily routines, it is necessary to let the children participate in the lighting design and let them make decisions about it, on their own. To make that possible we have to leave them space to be able to choose between different light scenarios and make the lighting as flexible as possible. The simplest but also most pedagogic way to achieve this flexibility is giving every lamp its own light switch and ideally also a dimmer. In that way the children are able to create their own light scenarios in a simple way. They choose consciously which lamp they want to switch on and which amount of light they need. Another simple method to teach a sensible practice with light is to use mobile light sources that the children can easily position there where they need them. To make this solution work smoothly in practice these mobile light sources should work without cable. Here solar powered reading lamps could be a possibility to solve this problem in a pedagogically reasonable way solar. It could become one of the children’s routines to place the lamps near a window for charging and then take each lamp to where they need it. This approach would additionally teach the children about the environmental aspect of the handling of light and electricity. It would show them the link between daylight as a natural resource and the artificial light. In that way, this lamp could become another tool, that makes the children think. But the kids should also get the possibility to play with light. Projection as introduced through the light projector offers great possibilities to let the children play with light in a very variable way. But the overhead projector is not the only tool that can be used to achieve the effect of scale change and shadow play.
A projected picture can be produced in different ways. This ranges from the classical shadow play which works with nothing more than a light source and a screen, over the projection generated by a slide projector or an overhead projector, up to the digital projection. The magical feature of any kind of projection is that light can make small things grow and let it appear in an unexpected way. There is for example the possibility to project a scenery that the children have built or drawn. Thru the projection which lets their scenery appear on the screen in life-size they can enter this environment made of light created by themselves.

The children are very interested in different technical innovations. Thinking about their computer sun and the computer operated green house it becomes obvious, that it would be wrong, not to introduce them to new technologies concerning light and projection. One of these new technologies is the interactive projection that can create a virtual playground. Within this projection an infrared camera senses the movements of the children and the projected picture is able to react. The children don’t sit any longer in front of a computer but can play with their whole body on a virtual interactive platform. Maybe this “living surface” is a light toy for the next generation where reality meet virtuality with the help of light.
Conclusion

Presenting the light project I tried to show how open-minded children are concerning light and how the curiosity that children by nature have towards light can develop into a strong sensitivity. I believe that in the same way as it is important to introduce children into basic values in our society like environment protection or a responsible handling of raw materials, to preserve our living space and keep it a place to feel comfortable, it should be important to know what we need, to feel comfortable inside a room, considering the fact that we all are spending more and more time inside. Outside it is the nature that brings us comfort. It is the sun providing us with heat and light and there are the plants and the animals around us. These basic components have a very big variety. The light outside is changing constantly in its intensity and direction according to the time of day. Inside a room it is often even light from the ceiling provided by a certain amount of florescent tubes which doesn't change 24 hours a day, the whole year round. For children this is usually the normal situation in the kindergarten or at school.

But a child that has learned about lighting already in the first years of its life will not be satisfied with a standard lighting solution as a grown up. A person that has learned about light as a child will always consider light as something important, something that is worth to care about and will be concerned about a certain light quality instead of just seeing light as an amount of lux.

In the end of my thesis I cannot offer a perfect lighting solution for the kindergarten or the ultimate light toy but I have learned through the light project, what is important to think about designing light for children. To design light for children means to me creating a light environment that encourages the kids to control the lighting and to adjust it according to their needs. Considering their very different way of thinking compared to the adult's thoughts, we shouldn't offer them a lighting solution that is perfect according to our ideas but a lighting that gives the children the task, to find the perfect lighting situation on their own. The lighting design should challenge the children. It should be an open, flexible and variable lighting solution that can be completed by the kids after their own ideas and that allows them to play with light.

Furthermore lighting designers should try to create an environment where light plays a major part in the children's daily routines. It should accompany them like a friend who is there constantly and in a way, so that every single child is aware of that. It should not be only a part of the room that the children take for granted but a companion that is important and appreciated.
Images

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