AutoPOIESIS

Perspective on sustainable, meaningful education

Guus Geisen
Sara, aged 10

- meer sluiten
- meer groen
- meer spelen
- veel dieren

- minder
- veel dieren eten zoals:
  - koe, varken, kip en vis

- minder
- kolen en olie gebruiken

- mensen moeten minder dik worden

Duurzaam
**Autopoiesis**

Autopoiesis literally means ‘self-creation, self-production’ and was introduced by the biologists Maturana and Varela in 1972. Here, they provide their perspective on the biological foundation of cognition and knowledge.

A cell consists of a number of parts including a nucleus, the DNA and a membrane. The membrane is semi-permeable which enables the cell to develop a relationship with the environment. As a result, the cell changes, grows and develops.

Cognition, according to Maturana and Varela, can be characterised as an effective action which enables a living system to exist in a certain environment, thus creating its own world. If we want to give children the opportunity to exist in a certain environment (today’s world), we need to give them the safe space in which to develop a relationship with the environment and allow them to create their own world, a world with greater meaning and sustainability.
Guus Geisen has chosen for the title of his book on education the unusual word Autopoiesis. The title, which means “self-making” (auto=self; poeisis=making) refers to Geisen’s focus on methods of education that help children make themselves into the best people they can become. Autopoiesis—“self-making”—occurs when children discover meaning in lessons—meaning that will sustain them as they develop skills and gain knowledge. Geisen shows, for example, that meaning sustains young people when they join lessons to the real world, examine emotion, use systems thinking, recognize the interdependence of all life, and help others learn. Autopoiesis should be in the hands of all teachers. This guide to drawing forth a child’s promise is essential reading for all educators and parents.


“At this point in human history, education has never been more critical to understand, solve and implement. This is a timely and important book; critical to the future of education. All of us must start moving in this direction, while the planet still has time.”

**ERIC JENSEN**, Ph.D.

As educators, we all strive to identify the most effective strategies to prepare students for the future. This thoughtful analysis highlights the need for educators to take a more constructivist approach to instruction and to design meaningful learning experiences that engage students in the process of grappling with complex issues. The actions recommended by the author, Guus Geisen, are sure to inspire discussion and action for change.

**MARY SCHEETZ**, Waters Foundation Portland Oregon

“Anyone involved with the education of children will appreciate the depth and breadth of Guus Geisen’s visually engaging book, Autopoiesis. As a child-centered study on learning, each chapter takes a slightly different perspective resulting in a comprehensive investigation that is personal and compelling. Colorful illustrations, moving anecdotes and powerful insights provide the reader with a meaningful opportunity to reflect on what matters most in schools.”

**TRACY BENSON**, Ed.D., President Systems Thinking in Schools Waters Foundation Systems Thinking Group

“…we need to give them the safe space in which to develop a relationship with the environment and allow them to create their own world, a world with greater meaning and sustainability.”

Guus Geisen does summarize key conditions for young people, all people actually to feel inspired to learn, grow and actively create a new world.

**Relationship** — with the real world from age 0 is the living systems prerequisite for healthy development. We cannot incubate ourselves in institutions for 12-16-20 years and then jump out as Athene from Zeus’s head ready for the world to welcome us. Especially in a world of rapid changes! We need the ongoing feedback learning loops. Guus Geisen describes it with great details. Not only the vision, the passion and the methods but his life long experience on the way stands and shines behind the book.

**Environmental** relationship to the natural and human systems requires compassion and dedication, which in a life curriculum of heartfelt systems thinking may well be cherished and nurtures the world.

**Create their own world**, which to hold meaning and sustainability needs new understanding, new thinking and innovative solutions. Thus Guus’s work with small kids to connect them into the world of adults as partners and meaningful thinkers and actors, offers a major step to develop self esteem and self-trust to cooperate.

Systems thinking as a core human capacity holds a major promise for a shift to happen in education. Why? As seeing the larger picture, understanding complexity starting from a class, a family or a school or local community perspective offers opportunities to apply immediately the new understanding. It also refines the mind, opens spaces for the subtleties of interconnectedness and the realization, that this interconnectedness is everywhere and for a small child it also reaffirms their original capacity of feeling and seeing the world in this wholeness. So reaffirms self esteem and trust in their mind capacity.

So the various mind functions for the future are truly important, but what is tangible and powerful in this book is not only a deep mental understanding of what needs to be done in practice, but the shining presence of the author matured in years of practice, dedication and pure heart, which offers a core essence and promise for all readers to be inspired into
new action. This is a book written by a compassionate mind, and that is what we all need in order to live a meaningful and creative life for a better future.

I met Guus more than 10 years ago at a SoL Sustainability gathering in Paris, I remember the impression he made on me when I heard him talking about his call — the call to co-create a field for new education, the love for the students and kids he deeply cares about, the clarity of the mind essenced in practice and devotion and knowledge applied through the heart. May we all who chose to read the book find the encouragement and inspiration to follow the path we need to step on.

Budapest, 2014, February in the sign of Aquarius

AGOTA E. RUZSA, Director of SoL Institute, chair of Learning Organisations for Sustainability, Board member of Global SoL

Ever since human civilization emerged, there have been two basic functions of our systems of education: the development of people and the development of society. At few times in history have we been in greater need of reestablishing this sacred connection. Without it, our society drifts towards destruction and our children have little idea of the story we might live and their role in creating that story.

For many years a leader of the global systems thinking in education movement, Guus Geisen combines deep experience in the classroom and in developing teachers with deep insight into tools and ideas for shaping an education system that continually learns and innovates. The progress of this movement in the Netherlands has been an inspiration to us all around the world.

In this exciting book, Geisen outlines the next stages in the journey toward a system of education that differs fundamentally from the predominant industrial model — one based on the science of the brain and of living systems. I sincerely hope his country is ready. The world needs visible examples of leadership in creating education that is truly meaningful for today’s students and moves us toward a just and sustainable world.

PETER SENGE, MIT and SoL

If one word could summarize the greatest challenge facing humankind as we enter the dawn of a new millennium, that word would be Fragmentation. We are reaping the consequences of a way of thinking and living that has created organizations, systems, and countries that operate as if they are islands unto themselves disconnected from the destinies of everyone else. Nowhere is this crisis of fragmentation more pivotal to address than in our system of educating our children. In Autopoiesis, Guus Geisen tackles some of the most important sources of fragmentation—the isolation of school as separate from society, the disconnect between what is taught and the context of the learner, the alienation of the child from her own learning process—by offering an alternative that shifts the approach of education from something that is done “to” or “for” our children, to one that is done in partnership “with” them. It presents a refreshing vision of an education system where we provide not just the content but the context for learning, where meaningfulness lies at the heart of every engagement, where we truly commit to develop every child to his or her full capacity, not just to the limits of our preconceived notions or our arbitrary budgets, and one in which our children feel valued as integral contributing members of society.

If we are to stop perpetuating fragmentation and start transforming our consciousness to be more systemic and sustainable, it is imperative that we transform our system of education in service of that shift. Autopoiesis provides us with a compelling way to begin that process.

DANIEL H. KIM, Founding Trustee, Society for Organizational Learning (SoL)
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Structure

In the introduction I look at the essence of sustainability as described by the Brundlandt Commission in 1987, and what I think it lacks. It explains the basis as to why we need to involve children in their future. Then in chapter 2 I look briefly at the difference between children and adults and how their brains work and develop. What insights into the brain’s working inspire us to integrate the learning process of children and adults?

Chapter 3 shows that meaningfulness is an important variable with respect to learning and development. If teaching materials are not meaningful, it becomes difficult to embed them in the long-term memory. What is meaningful for children?

In chapter 4, my aim is to get three children to talk more specifically about what they see as meaningful: Rembrandt, Severn and Felix talk very definitively and with passion and engagement about what they think and feel regarding what is needed in these times. According to them we should in fact stop reading this book, roll up our sleeves and act.

In chapter 5 “The importance of the framework of reference” I focus on a number of theoretical perspectives, the thinking behind our actions. What developments are flickering on the horizon, what is bubbling away, what is crying out for attention and what are those involved talking about when it comes to children and the future? This summary of various perspectives is far from complete but it fits with education and sustainability. I hope to further expand this chapter in the dialogue. Let’s take a good look around ourselves and see what there is to see and understand.

In the section on learning to work with the issues of the future (chapter 6) I set out the basis for the key classification of work: optimum development as a person, as a professional and as a systems citizen.

In chapter 7, which looks at the educational system of the future, I get a number of children to talk about their imaginary perspective of the future. They imagine what they will be like and what they will be doing in 2028. I then describe how ‘backcasting’ can be a concrete way of working towards the future. What may be the important corner stones for the educational system of the future? The scenario of how the future might be can lead to more conscious and targeted actions in the HERE AND NOW and towards the future.

If the vision of the future is central, the divide with reality becomes real. I describe this using a behavioural graph in chapter 8 to then reach a possible format for education in chapter 9. What do we need to think about when designing the school of the future? What do we see emerging and what do we need to focus attention on? I use 5 architectures as a lever for the design of the school for the future.

The next chapter looks at actual practice with respect to resources and approaches which you can use to give shape to innovation, and includes concrete real life examples. Using the theory and resources available today, we can make the future a reality and demonstrate this to children in practical ways. To me, these are always the pearls of the process: children show us that it’s possible. Time and again, children inspire me to push the boundaries. I hope with all my heart that my readers and all those involved experience the same thing.

In chapter 11 “Conclusions and recommendations” I formulate a number of ideas for action. The next 5 to 10 years will be very important for the development of education and the children that are dependent on it. Let’s all join forces and together drive change in education.

In chapter 12 I explain briefly who the participants in the interviews were. A brief summary of the additional perspective can be found throughout the entire document.

If you want to quickly skim through the essentials, you will find the summary in chapter 13 helpful. See chapter 14 “Bibliography” if you need a more in-depth understanding or wish to consult the references to literature.

I finish with a word of thanks to all the people involved.

Enjoy reading. I look forward to meeting you in the dialogue.

Guus Geisen
The impact of education as expressed by Harry Chapin in his song “Roses are red”.

The little boy went first day of school
He got some crayons and he started to draw
He put colour all over the paper
For colours was what he saw
And the teacher said, “What you doin’ young man?”
“I’m paintin’ flowers” he said
She said: “It’s not the time for art young man
And anyway flowers are green and red
There’s a time for everything young man
And a way it should be done
You’ve got to show concern for everyone else
For you’re not the only one
And she said, “Flowers are red young man
And green leaves are green
There’s no need to see flowers any other way
Than the way they always have been seen”

But the little boy said
“There are so many colours in the rainbow
So many colours in the morning sun
So many colours in the flowers
And I see every one”

Well the teacher said, “You’re sassy
There’s ways that things should be
And you’ll paint flowers the way they are
So repeat after me
And she said, “Flowers are red young man....”
But the little boy said
“There are so many colours in the rainbow...”
The teacher put him in a corner She said,
“It’s for your own good
And you won’t come out ‘til you get it right
And are responding like you should”
Well finally he got lonely.
Frightened thoughts filled his head
And he went up to the teacher And this is what he said:
And he said
“Flowers are red
And green leaves are green
There’s no need to see flowers any other way
Than the way they always have been seen”

Time went by like it always does
And they moved to another town
And the little boy went to another school
And this is what he found
The teacher there was smilin’
She said, “Painting should be fun
There are so many colours in a flower
So let’s use every one”
But that little boy painted flowers
In neat rows of green and red
And when the teacher asked him why
This is what he said
“Flowers are red...”
"Mum, compulsory education......does that mean it’s compulsory for them to teach me something?" Yoël, aged 6

Sustainability is the bi-product of the education you have experienced.

Good education is sustainable. But what do we really understand by the terms sustainable and good education? The Oxford English dictionary defines sustainable as: able to be maintained at a certain rate or level, able to be upheld or defended. The term sustainability is very common and subject to varying interpretations. Everyone uses the word in a specific context, thus giving more meaning and shape to sustainability. It is a trend with all the inherent consequences, and at the same time it is a sense of urgency to look, think and act from a more sustainable perspective. And yet we put off ways of acting more sustainably with apparent ease. This publication is not intended as an interpretation of 'good education and sustainability', it is more of a perspective on the possible interpretation of the two terms and an invitation for dialogue, but with a focus on concrete objectives in the short and long term.

The term ‘sustainability’ has been used a lot in recent years and has been interpreted in many different ways. In 1987, the UN Brundtland commission formulated the meaning of sustainable development as follows: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

This definition originates from an ecological approach to developments in forestry and fishing where scarcity prompted agreements regarding the extent to which systems can repair themselves. This means that opportunities for future generations to also use these sources are respected. During the UN conferences in Rio De Janeiro in 1992 and Johannesburg in 2002, sustainability-related agreements were reached on using energy more economically and carefully, diversity and investment in knowledge, education and to enable future generations to achieve an acceptable level of well-being. This ecological approach is summarised using the ‘Triple P’ perspective: People, Planet, Profit summarises the core of sustainability.

In addition to the perspective on sustainability above, it is important for us adults to prepare future generations as effectively as possible for their future. “...without compromising the ability of future generations to meet their own needs” is a passive perspective. Optimum opportunities for development require adults to play a more active role with respect to the quality of the growth and development of future generations. Preparing future generations for their contribution to the future requires more in-depth thinking about the format of training and education in the HERE AND NOW - and that is our responsibility as adults.

Optimum development of the ecological and socio-cultural aspects of our future generations demands investment in three areas, with respect to both the parts and the mutual interaction between the parts:
optimum development as a person
In the sense of continuing to be the person I want to be. Who do I want to be as a person? What is the most important core of me, the thing which determines my relationship with myself, with other people and with my environment? How do I learn to deal with emotions and what I want to achieve in my life?

optimum development as a professional
In the sense of developing skills in interacting with yourself, a topic/problem, other people and having a sense of responsibility for society today and in the future. Learning to make choices and understanding the impact of these choices over time and place;

optimum development as a systems citizen
In the sense of mutual connection with yourself, other people and your environment. The understanding that we are all part of an inter-connected system. By promoting inter-connectedness and systems thinking, we learn to look at the whole and the parts as well as the mutual relationships. We understand how ecosystems work and what impact we have on the big whole.

Children in primary education are receptive to connectedness and responsibility.
The pedagogical task with respect to sustainability for the future can be driven by the values connectedness, responsibility and respect.

In recent decades, development has been driven by self-interest and disengagement. This has resulted in us alienating ourselves completely. If you disconnect everything, you are left with maths and literature, Luc Stevens

In recent years, I have had opportunities as a person and as a professional to work with some inspirational people. By attending international conferences each year and, as the Foundation for Sustainable Learning (Stichting Duurzaam Leren) organising our own conferences with national and international speakers, I have been able to develop a deep connection to the ideas put forward by these professionals.

A few examples: ‘The Fifth Discipline’ by Peter Senge was the first theoretical book to affect me and this set the foundation for my perspective on the importance of systems thinking and the essence of learning instead of knowing. Meg Wheatley looked further into the essence of leadership and emphasised that development comes from the underlying principles which you apply. Otto Scharmer took it even further by asking for greater awareness of the source from which you operate. He gave me his perspective on an ‘open mind, open heart and open will’ and Theory U, an impulse to do what really needs to be done. Howard Gardner’s perspective helps me to see and understand that there are even more perspectives. His ‘Five Minds for the Future’ indicate where investment is needed in the 21st century when it comes to children’s development (and your own development and that of other people). My test for the usability of concepts is always their application in children’s learning process. If I am also able to apply a theory designed for business to working with children, I get excited.

During this research, I was deeply impressed by children as a source from who to learn. In addition, I increasingly realised that children are capable of far more than we as adults expect of them and there is a big divide between the world of children and the world of adults. This realisation has triggered my actions in supporting innovations in the classroom and in schools and in writing this publication. Children are keen to
help us to innovate in education and driving it towards the eco-social educational system of the 21st century. They are the people concerned who are the least affected by our current educational system and this unique perspective makes them a valuable partner.

Netherlands Enterprise Agency (RVO.nl) Learning for Sustainable Development programme has not only commissioned me, it has also provided great impetus for me to set down on paper my perspective on the eco-social educational system of the 21st century. Before I started writing, a number of people provided major input by sharing their thoughts with me in an interview. My aim in the time available was to collect as many different perspectives as possible about the question as to why it is important to involve children in their future and what this may mean for the design of the educational system of the future. Their input was invaluable. Not only did they share their perspective, they also added breadth and depth to this publication. I would like to thank you very much indeed for your input.

The co-creation process is far from complete and I hope that together we can give shape and content to the future of our educational system so that children can experience the change they want to see in the world.
“CHILDREN GO TO SCHOOL SO THAT IN THE FUTURE, THERE WILL BE GROWN-UPS WHO DO UNDERSTAND HOW TO TREAT PLANET EARTH PROPERLY”

Rembrandt, 8 years old (the Council of Children, Missing Chapter Foundation – www.missingchapter.org)
How does the child’s brain work?

Sara, aged 10
How does the child's brain work?

Sara, aged 10
Letting go is to hold tight differently

There is considerable difference between an adult’s and a child’s brain. The rational part of the brain does not fully develop until somewhere between the age of 20 and 25. This means that young people are not very capable of planning and foreseeing the consequences of potential actions (Jelle Jolles 2010). In recent additional research, Jolles established that this is not so much to do with the brain not yet being fully developed, but that young people lack the experience to plan effectively and foresee the consequences of their actions. They are far better able to do this in a meaningful context. This calls for creating an educational system in which children amass experience in a meaningful context and learn from this experience. Children are very capable of making a choice. They base their choices on variables other than rational variables. They are guided more by how they feel and their intuition and in these situations they are also capable of planning and foreseeing the consequences of their actions (see the examples involving Severn, Felix and Rembrandt). This forms the basis for major collaboration between children and adults. We adults have the tendency to use too much of our rational brain and are increasingly losing the connection with what is really important. We see examples of this every day in the media.

Children instinctively know what is important but they are not yet capable enough of foreseeing the consequences. It is therefore good if children have the opportunity to learn about the future in a safe environment and how the future may change if they make certain choices. The perspective on a good future is anchored in our brains because of prehistory and the origins of man. Our brains have also learned to deal with information from the environment quickly and effectively. Living in pre-historical times, if I hear a sound in the bushes I need to know immediately whether it is my lunch or whether I am lunch. If I take too long deciding, I won’t survive. This basic ability is still innate. It is far more difficult for our brains to respond appropriately to gradual changes and subtle differences. We understand rationally that it is bad to pollute the environment but we do nothing about it, partly because our brains do not see this as an immediately life-threatening situation. In education, we can learn together to deal appropriately with these situations which are highly threatening in the long term. We need to learn how to handle gradual changes and subtle differences. School is the place to learn that from a young age.

The brain probably developed in three phases throughout evolution: the instinctive brain (the reptilian brain, brainstem), the emotional brain (earliest mammals, limbic system) and the thinking brain (new mammals, neocortex) (Cain 2009, Fogarty 2009). In evolutionary terms, the rational brain is the youngest part of the brain. All three are an integrated part of our brain but they still have important partial functions. In a life-threatening situation, the reptilian brain is ready for action at all times. The reptilian brain never sleeps! When emotion comes into play, the rational brain is less available. This means that rational learning is more difficult if the learner experiences negative emotions when having to meet expectations. This means that in education, we need to focus consciously on learning to deal with emotions.

School can achieve this in a safe way. For this, children need to learn how to work together effectively. We need one another and the better we understand that as youngsters, the more connections are created in the brain to make collaboration possible. Through collaboration, we together create who we want to be. Through the quality of this collaboration, we also develop the basis for the cultural identity of our society.

There is scientific evidence that for a specific period in childhood, young children are open to learning language or music, for example. Analogous to these insights, it is feasible that children are able to learn at a young age what it means to look, think and act sustainably, making it more likely that as adults, they will unconsciously act more sustainably. A traditional solution would be to include ‘sustainability’ as a subject in the curriculum. However it is not possible to add more content to the current curriculum. The focus in education in The Netherlands, stimulated by the government, is firmly directed at achieving optimum development in the areas of maths, language and reading. There is nothing wrong with this. It goes wrong when we believe that we derive great results in terms of maths, language and reading by working on maths, language and reading. It has been scientifically proven that regular practice during the primary school period when learning to play a musical instrument or working with art results in a significantly higher test score on maths, language and reading (Geisen 2011, Jensen 2008).
Dit vergt een herbezinning op de organisatie van het onderwijs. Dit requires a rethink of how education is organised. By breaking down knowledge and information into parts, we have reached the limits of the system. We cannot split the system down even further into parts and then give each of these parts the attention they deserve. Every approach to a subject area has been developed to perfection and it is cumulatively impossible to execute all the methodologies for the various subjects as prescribed within the current classroom time, which are governed by a day/week/month/year.

If dividing the whole into transparent parts no longer works, what does? Based on innovative insights into how the brain works, it is clear that the starting point needs to be creating connections and context. If the connections are meaningful, they can also be retrieved from the memory. This is conditional on there being an associated positive emotion and experience and that these are meaningful (Geisen 2011).

Poor education will no longer exist in 2025. E-learning will mean that someone can transfer knowledge sublimely all over the world. Real-time translation will make all transfer of knowledge accessible. It will be the basis for lifelong learning, opens up curiosity and activates self-learning capacity. Learning needs to be a game where you have to form a team to process development, Education will no longer be focused on specific professions but on the essential skills underlying professions. Jobs are Out, Skills are In”. Every child and every adult must ask themselves the question: “Am I better than a robot?” which underlies professional categories. We hope that global developments will make us stronger in our own environment, resulting in more local production and consumption. This has consequences for both the physical and virtual design of the infrastructure. Hyper-connectedness is a major hindrance to deep connectedness with the surrounding environment. Education is asking itself how to handle ‘hyper-connectedness’. We need to learn to say NO more often. What do/don’t I want to share and what do/don’t I want to be a part of?

» 10 predictions for education in 2025
» The future of education: is online learning the future? Marcel Bullinga (futurist)
The key to innovation in education is meaning. Creating sense and meaning is a simple yet effective way of motivating people to make sure that they get the best out of themselves and then apply this to the benefit of the greater whole. Tex Gunning

Positive emotions in a subject make the subject meaningful. If learning is not meaningful, what has been learned will not be retained in the long-term memory. Via the internet, children have access to all possible information. Can we teach them to handle this information effectively? What were meaningful situations in traditional education are now less so or not at all. Children learn to deal with the world by actually dealing with the world in a safe context.

Furthermore, it has been demonstrated that the brain needs learning to be meaningful. If the learning is not meaningful, what has been learned will disappear again while sleeping overnight so that there is room to learn meaningful things the next day.

Meaningfulness depends on the context in which you live, think and operate. This publication uses quotations from great thinkers. These quotations are the product of a deep-seated struggle with a meaningful context and the discovery of the essence, the core. Newton, Einstein, and Maturana are great thinkers who, in their own way, have created a connection with a context that is meaningful to them.

In 2005, the British Royal Society named Sir Isaac Newton as the greatest thinker in the whole history of science. In his key work, Philosophiae Naturalis Principia Mathematica which appeared in 1687, he described gravity, and three laws which are now known as ‘Newton’s three laws’. This has made him the founder of classical mechanics. He developed the theory of colours based on the prism and studied the speed of sound. He experimented and studied in order to explain the unexplainable. Newton’s methodology was heavily based on observation and experimentation (on meaningful learning). Newton has had enormous influence on thinking and on science, but also on people’s everyday life and work. Some of our need ‘to know’ and ‘to have knowledge’ is rooted in this, and this is still important today.

In modern natural sciences, Albert Einstein’s theory of relativity has complemented Newton’s theory of gravity.
If the context is not meaningful, there is a good chance that no connection will be developed with the context. If there is no connection, the context becomes less meaningful. The negative spiral also intensifies. If a child’s brain is stimulated by a meaningful context, the results can be increased. If the curriculum cannot be made meaningful, any additional instruction regarding content will be of limited effect.

If the principle above could be a guiding perspective for the future, it will also provide feedback on our current educational system. In discussions with young people, I increasingly hear that while they may have a lot of teaching resources at school, they have no idea what to do with these resources. Learning only really begins when, in a real working situation, they have to connect with a concrete problem and understand what is required of their capacity to learn.

In the Netherlands education in kindergarten is characterised by a meaningful way of working. Children aged between 4 and 6 are working independently and jointly on the basis of topics and the opportunity of selecting a project. Even the simplest construction of being able to choose a project using a planning board makes the set-up more meaningful. The emphasis is more on making the choice and less on planning. If the set-up is no longer available because too many children have opted for this set-up, the child needs to make a different choice. If you have selected a set-up at the start of the week, you need to select differently for the rest of the week. This means that you learn that making a choice has consequences. Upwards of first grade, most schools opt for more directed teaching, because that is when ‘the important learning process’ begins. At this stage there is no more choice, learning is less focused on experience and more focused on ratio and for many children, the meaning disappears.

Meaningful learning takes on a didactic responsibility. For example using a picture book at kindergarten or a story or fairytale in primary school education. ‘Storytelling’ remains a power tool in giving meaning. We can use real life stories from close by or further away. The community has enough complex stories to give all children a meaningful context to their curriculum. When working with a meaningful context, the curricula are made meaningful, but children also learn that they can be meaningful to society. Systems citizenship in its optimum format.

If we then connect meaningful context with the issue of sustainability, children then develop skills and attitude as a sustainable person, professional and a systems citizen. They achieve optimum results with respect to maths, language, reading and all other specialist areas.

Another important effect may be that actual collaboration between children and adults is necessary to build bridges between the two worlds. Children learn from adults and adults learn from children. Up until now, there has been too much of a distinction between the two worlds.

By internalising a problem educationally, children become part of the solution to the problem that has been created by their parents. As a result, sustainability becomes an emancipatory process in addition to an economic challenge. This shift is achieved only if education is seriously translated into actual participation via communication. If sustainability is to endure in people’s minds and vision, ecological awareness must be developed in primary education and continued in secondary education. Henk Oosterling
MEANINGFUL SEEN THROUGH EYES OF REMBRANDT, SEVERN AND
NESS

GH THE

BRANDT,

FELIX
We are teaching our children to be successful in yesterday’s world. I want my children to be taught to be happy in tomorrow’s world. Tex Gunning

Rembrandt “Children go to school so that in the future, there will be grown-ups who do understand how to treat planet earth properly”.


Severn At the age of 12, Severn Suzuki spoke passionately at the UN World Summit in 1992 about her hope for a sustainable world (see: http://www.youtube.com/watch?v=uZsDiIXxyAY). She received a standing ovation. A quotation:

“I am fighting for my future. Losing my future is not like losing an election or a few points on the stock market. I am here to speak for all generations to come. I am here to speak on behalf of the starving children around the world whose cries go unheard. I am here to speak for the countless animals dying across this planet because they have nowhere left to go… I’m only a child, and I don’t have all the solutions. I want you to realize, neither do you. You don’t know how to fix the holes in our ozone layer. You don’t know how to bring the salmon back up a dead stream. You don’t know how to bring back an animal now extinct. And you can’t bring back the forest that once grew where there is now a desert… If you don’t know how to fix it, please stop breaking it… I am only a child, yet I know that we’re all in this together and should act as one single world towards one single goal… At school, even in kindergarten, you teach us how to behave in the world. You teach us to not fight with others. To work things out. To respect others. To clean up our mess. Not to hurt other creatures. To share, not be greedy. Then why do you go out and do the things you tell us not to do? Do not forget why you are attending these conferences – who you are doing this for. We are your own children. You are deciding what kind of world we are growing up in. Parents should be able to comfort their children by saying “Everything’s going to be all right. It’s not the end of the world. And we’re doing the best we can.” But I don’t think you can say that to us anymore. Are we even on your list of priorities? My dad always says “You are what you do, not what you say.” Well, what you do makes me cry at night. You grown ups say you love us, but I challenge you, please make your actions reflect your words.”

Felix On 2 February 2011, 19 years after Severn Suzuki, Felix Finkbeiner addressed the United Nations in New York at the start of the “the international year of the forests” where together with a group of children he asked attention to be paid to their future. (see: http://www.youtube.com/watch?v=Sur8coFEoTU). A quotation:

“We children understand that the adults know everything about these crises (poverty and climate). But we children don’t understand why there is so little action… We children discussed why there is so little action and we ended with three possible reasons for this:
First reason might be the perception of future. For most adults future seems to mean twenty, thirty years or even forty years. But for us children 2100 is still in our lifetime. For most adults it is an academic question if the sea level will rise for 1, 2 or 3 cm. or 7 meters until the end of this century. For many of us children it is a question of survival. Another reason might be that many adults seem to hide behind the climate skeptics, the one that say there is no climate crisis. We children also often discuss about that topic… If we follow the scientist that say there is a crisis and we act and in 20 years we find out that they were wrong, then we didn’t do any mistakes. But if we follow the skeptics and don’t do anything and in 20 years we find out that they were wrong it will be to late to save our future… From this analysis we children understood we cannot trust that adults alone will save our future. We have to take our future in our own hands.”

It is their world. And so we need to involve them in it, Willie Smits

Rembrandt, Severn and Felix and all other children are the foundation for this book. They hold a mirror up to us and can help us as adults to make the choices needed to create a more sustainable world. Severn speaks directly to our heart. Felix adds a more rational perspective and Rembrandt brings direction to the long-term campaign. School is the place where children can learn how they can make a contribution to themselves, other people and the world. This means a fundamental rethink of the vision, the meaning, the function and the format of our education.
“...IF YOU DON’T KNOW HOW TO FIX IT, PLEASE STOP BREAKING IT.... I AM ONLY A CHILD, YET KNOW THAT WE’RE ALL IN THIS TOGETHER AND SHOULD ACT AS ONE SINGLE WORLD TOWARDS ONE SINGLE GOAL...”

At the age of 12, Severn Suzuki spoke passionately at the UN World Summit in 1992 about her hope for a sustainable world. She received a standing ovation.
The importance of the framework of reference.
The importance of the framework of reference.
5 THE IMPORTANCE OF THE FRAMEWORK OF REFERENCE

We can’t solve problems by using the same kind of thinking we used when we created them.
Albert Einstein

It is down to us adults to give shape and content to the future as a living system. It is difficult to do that based on Newton’s underlying principles and classical physics, with the key terms being knowledge, fragmentation, uniformity and productivity. If we want to achieve development, we need to be aware of our underlying mental models and the principles or foundations from which we look, think and operate.

Margaret Wheatley (2006) describes the development of organisations from the perspective of a living system rather than from the perspective of machine thinking. Both perspectives have specific consequences for the format of an organisation. The basic premises, principles or foundations which we deem to be important and which direct our actions result in a specific design or planning. By reflecting on the resulting planning we can obtain a lot of feedback on the outcomes and whether we had aimed for these outcomes. It is important here to look not just at the result and to solve problems (Single-Loop learning) but to also look at the underlying principles and the thinking behind the problems (Double-Loop learning) (Kim, 2009). Should we be guided by the essence of learning or by the essence of knowing? Both concepts have a lot in common but there can be a world of difference between them. To what extent are we aware of what we know, where our knowledge comes from and what its effects are?

What basic premises, principles or foundations do we apply consciously or unconsciously as the basis for our actions? According to Margaret Wheatley (2006) order comes from chaos as a principle of living systems. She uses the ‘chaos game’ as an example, which involves working with a dice and an equilateral triangle. At the corners are the numbers 1-2, 3-4 and 5-6. If you throw one of the numbers, you place a point halfway between the point you are at and the corner with the number that you have thrown. You start at any random point. If you repeat this action for 24 hours, what might you expect to be the pattern of dots produced? Most people guess that the outcome would be a random pattern of dots, with areas of varying density of dots. Virtually nobody guesses that an actual ordered pattern would emerge from that seemingly random process of throwing a dice.

Education either functions as an instrument which is used to facilitate integration of the younger generation into the logic of the present system and bring about conformity or it becomes the practice of freedom, the means by which men and women deal critically and creatively with reality and discover how to participate in the transformation of their world. Paulo Freire

People are generally surprised by the perfectly ordered shape of triangles that emerges. We tend to fear chaos (of a random process, for example) and try to create order from outside by imposing control because we don’t understand nor trust that an underlying order might emerge from within that is natural to the system. Similar to the way we mistakenly focus on the short term “certainty” because the long term future seems too distant and uncertain for us adults, we mistakenly extrapolate the uncertainty of the short-term (rolling of the dice) into even greater uncertainty of the long term (larger pattern). What we fail to appreciate is that there may be an underlying order to seemingly chaotic processes. The emergence of this ordered shape of triangles is called a strange attractor, “where a dynamical system is comprised of a set of physical properties toward which a system tends to evolve that has a fractal structure, regardless of the starting conditions of the system” (Wikipedia).

Figure: the chaos game
So, if you start from a living system based on a few common underlying principles, order may ultimately come about, even though it seems unpredictable at the outset. This means that we achieve development that is supported by everyone involved if we assume specific, jointly agreed starting shared principles. This is why it is so important to create a safe environment together.

Take good care of yourself  
Take good care of other people  
Take good care of our environment

Sustainable development:

Sustainable development:

An example:
Together with everyone involved, the school chose the starting principles above. The visualisation was drawn by one of the children and one of the parents concerned converted it into a usable format. Children in all groups work on firming up the starting points. Each day, the children reflect on their actions from this framework of reference. When we want to achieve a new development, it helps to establish a few starting principles (or structures) together which can serve as the framework of reference. The framework of reference needs to be re-established on a regular basis. You cannot set these principles and rules and then just forget about them. They must be “re-invigorated” every time a new participant joins the group or in each new group or at the start of a new school year.

Integrity nowadays means incorruptibility and steadfastness. This is a long way from its origin: wholeness, rectitude, or being integrated. This requires the ability to think and act in an integrated way including and with an understanding of all relevant principles and facts. It is precisely this that is so lacking in people, society and business. Herman Rottinghuis

Every action results from our personal and shared framework of reference. What framework of reference does the eco-social educational system of the 21st century need? The transition from the framework of reference of the 20th century educational system based on machine thinking to the eco-social educational system of the 21st century based on the thinking of a living system, requires enormous effort from us all. Children can accelerate our learning process as adults.
6 LEARNING WITH THE ISSUE OF THE FUTURE
Knowing what to do when you don’t know what to do. (Costa 2000)

Cognition is characterised as an effective action that will enable a living being to continue its existence in a definite environment, thus helping to create its own world (Maturana, Varela 1992). This means that your imagination, your capacity for fantasy, are an important trigger for your actions. Through your actions you give shape to your world.

If we want to give children the opportunity to turn their head (heart and hands) to complex challenges of the future at any point, we need to teach them to tackle complex problems in a didactically responsible way. This is possible only in a safe and rich learning environment. This renders knowledge and skills meaningful. It is also highly motivational for children if they have a choice. Professionalism increases if they learn to reflect in depth on the consequences of their choices. The emphasis is more on the learning process within which we strive for optimum development as a person, as a professional and as a systems citizen and less on knowledge transfer.

As described earlier, someone like Newton has had a major impact on the thinking of many generations. What if we had paid as much attention to his learning process as to the outcomes of the process? We know that Newton was fascinated by things he didn’t understand. He then worked by observations and experimentation, discovering and learning his way to a conclusion. To get the core of a matter, he searched for applications so that he could again test his assumption and conclusion. This process can be seen in Otto Scharmer’s methodical approach and his Theory U (Scharmer 2009). Many people consider this theory to be the theory of the 21st century. The theory fits well with current times, but this approach to learning also suits any period in time. If you want to learn something, you need to have a deep connection with the subject in question. By creating this connection, you change, grow and develop as an individual. This means that you need a strong framework of reference to adhere to (Damasio 2009). This framework of reference forms part of the learning self and is, even if unconsciously, present from an early age. It is supported and in part shaped by the external framework of reference: the learner’s safe environment. It is about achieving balance between the environment and the talent. If you want to resolve a problem by connecting with

Children develop their personal and shared objectives head, heart and hand.
it through deep-reaching research, you need your own solid values, concepts, frameworks and theories. If these have not yet been sufficiently developed, the rich and safe environment needs to ensure these are firmly embedded. When grappling with a problem you therefore work on resolving the problem and on shaping your personal and shared framework of reference. But do we ask ourselves often enough what framework of reference we start from when developing a relationship with an object? Are we aware of our mental models and the fact that these are an important source for our framework of reference?

Learning is personal (the individual), it is social and it is focused on objectives (professional) and connected with the great whole (systems citizen). The sequence can make the description appear fragmented, but by association they are connected to each other in every respect. Optimum development can be seen as sustainability.

Optimum development as a human being
According to scientists in the documentary ‘The truth about violence’ by Michael Portillo, children reach their peak of aggression towards others at around the age of 3 because they are not yet capable of managing their primary impulses. If a new game is introduced to a group of 3-year-olds and the adults withdraw, there will be a fight over the new toy. Other children will withdraw. If the adult then takes an egg-timer to indicate the time when the children can play with a new toy, the children learn that they can share. This experience creates new connections in the brain, as a result of which children learn to manage their primary impulses. This example indicates the importance of working with children on the basis of specific principles or basic foundations. If you are able to establish certain key principles (like the six-sided dice and the three vertices of the triangle in the chaos game), you can produce the long-term predictability in a situation of short-term uncertainty. The use of the egg timer and the principle “to share” is an example of that. It offers a framework of reference that provides direction and security in the now. In this context the experience results in new connections in the brain and these lead to more social conduct in the future. But it also leads to internalisation of the framework of reference and that is the source of actions in the future. As a result, values develop within each of us and the framework of reference grows. So, together we need to co-create those values that would more predictably produce the long-term desired result of a sustainable community.

Aggressive conduct and words as well as bullying are a natural element of human behaviour. It is down to teachers and educators to ensure that this behaviour becomes unnecessary following the natural phase because other skills have been learned. Another important perspective of this is the importance of experience. Experience creates new connections in the brain. This means that experiences in the form of actively undergoing something are important for the brain’s growth and development. If this does not happen sufficiently with experiences of bullying, bullying and the associated values will be internalised. The mirror neurons (see page 35) then also play an important role as a result of which bullied children may themselves become bullies. If the bullying has been sufficiently dealt with afterwards, and lessons can be drawn from the situation in terms of values which convert the bullying into valued behaviour, this will be internalised by both the bullier and the bullied.

The example also demonstrates the importance of the role of the adult. The adult creates a safe environment in which the basic principles are clear as a starting point and as an instrument for reflection. This allows the learner to make mistakes and to learn. If the framework of reference has not yet been internalised, the student needs the teacher to embody the framework of reference.

Who am I and who would I like to be?
It is clear from the above that shaping the student as a person is incredibly important.

Example In 1999 Ryan, a 6-year-old, experienced at school a project looking after people in Africa with no access to clean water. He was so impressed by this that he decided to start saving for a well in an African village (http://www.ryanswell.ca/about-us/ryans-story.aspx). Following a long process with many setbacks, he finally managed to collect enough money to turn the well into a reality. It appears that he had already developed a strong inner (unconscious) framework of reference which meant that he would not be diverted from his intentions. This experience resulted in the realisation that he wants to join in more. The Ryan’s Well foundation has now established more than 700 wells. He hopes that his story will serve as a reminder that everyone can make a difference. You just need to find something that you have a passion for and do something about it.
To gain insight into who you are and who you want to be, you can use the circle of Multiple Intelligences (MI). This provides insight into each individual’s intelligences. Research by Howard Gardner (2002) shows that everyone has these 8 intelligences. It is not about how intelligent you are, but how you are intelligent. That is different for everyone. By using this circle and what they want to learn, children from the age of 4 can visualise themselves and the extent to which they have the different intelligences. Asking what children are already capable of provides a positive basis from which to take the next step to give shape to their own involvement and the desire to learn what they can’t yet do. After a time, the children choose what activities they want to do once they have finished their regular work. Some children choose to do something from one of the intelligences they enjoy and are good at and others opt to do something they are not so good at. Multiple intelligences is about celebrating the uniqueness of every individual, matching in line with what the student is good at and from there stretching all the intelligences in order to develop what is important and necessary.

Here is a brief description of each type of intelligence:

- **linguistic:** you are good at language, writing, poems and storytelling;
- **bodily-kinesthetic:** you have good physical coordination, you are good at sport, dancing and movement;
- **musical:** you are good at recognising rhythms and sounds, you are sensitive to the sound of voices, instruments and ambient noise;
- **intra-personal:** you have good self-awareness, you are good at reflection, inner speculation and metacognition;
- **interpersonal:** you are good at working with other people, you are able to understand and interpret other people’s views and what they are saying;
- **logical-mathematical:** you find it easy to solve problems, draw logical conclusions, work with symbols and recognise patterns;
- **visual-spatial:** you have visual talents and understand how things work and how they fit together;
- **naturalistic:** you feel at home with plants, animals and nature, you are aware of your environment and are open to it. You are good at spotting differences and similarities.
Howard Gardner did not complete his work and was still using his criteria to seek confirmation of four more intelligences:

- You are creative in putting together combinations of tastes and dishes;
- mechanical: you are good at thinking in, with and about tools, mechanical relationships and equipment. You love using and repairing tools, building models and doing practical things;
- emotional: you are aware of and able to handle your own feelings and other people’s feelings;
- existential: you are good at pondering on ultimate questions such as your place in the universe, and life aims.

Example In the 5th grade of a primary school it was difficult for the children to talk about personal things. The teacher then asked the children to make a 'me-box'. In this box they can tell their own story by decorating the box and placing things in it which they feel are important. Via the me-box, the children then find it easier to talk about themselves and to listen to other children with greater attention and respect because of the objects and the engaged way of talking about their own box. The children put the story down on paper and in the spelling class they looked for the connection with the spelling rules they had learned.

It is already clear from these examples how children can learn to deal with their own emotions. Internal drivers play a role in triggering children’s actions and they are not yet capable of effectively managing these impulses. Experiences help to create connections in the brain as a result of which, over time, they learn to control these impulses. Making a me-box and then seeing that it is easier to talk about personal things are important building blocks in learning to deal with emotions.

If you have an emotional burden it is difficult to have any influence on the situation using the rational brain. In this case it is desirable to use a tool which enables the emotional brain to distance itself so that the rational brain can get involved again. The habits of mind and the tools of systems thinking are excellently suited to learning to deal with emotions.

Using the ‘Habits of Mind Wall’, the children give shape to the ‘finding humour’ habit of mind. During this process, they jointly came to the conclusion that it is good to find humour, but not at the expense of other people.

In 6th grade, the children create a connection circle about the national test they have to do at the end of primary school. Lin concluded that they are better able to concentrate if the atmosphere in the classroom is good. A lot of arrows also come out of the variable ‘attitude’. This means that a good attitude is important. She also notes that reading a question properly reduces nerves. Reduced nerves in turn means that they are more able to read the question properly.

The concept of multiple intelligences provides opportunities to use interconnectedness to focus on different aspects. You learn to discover who you are and what you are good at, what you want to learn and what you want to work on yourself. It also provides the opportunity to learn with and from one another. Children can choose who they want to work with to achieve good results. You learn most if you can tell and explain to other people.
Learning to make a choice and learning to reflect on the intended and unintended consequences of this choice is an important variable in learning to deal with issues. A third important benefit is that your preferred intelligence can make it easier to learn things and internalise (stretching via matching).

**Example** A boy in 6th grade says that he likes being able to choose when he completes a specific task within the weekly tasks. He doesn’t like it when the teacher tells him what he has to do and when to do it. If he can choose for himself, he believes that he can complete the task better.

This is consistent with what Daniel Pink (2010) talks about as the new “operating system” for management that is far superior to the old one: Autonomy, Mastery, and Purpose.

Our current educational system invests primarily in the perspectives of linguistic and logical-mathematical intelligences. There is a big gap with teachers’ needs. They understand the importance of investing in all the intelligences but it is difficult for them to achieve this under the current system. It is possible to generate higher yields by investing in all the intelligences (perspectives) and then make the transfer to linguistic and logical-mathematical intelligences. Insight comes from having the broadest possible orientation and functional experiences based on meaningful situations. Knowledge is better anchored in insight. This can happen only if the child can safely develop as an individual at the same time.

**Optimum development as a professional**

Optimum development as a professional relates to how you as an individual deal with the complexity in your environment. Create interconnectedness with an object (a problem, a dilemma, your emotions, other people etc.) so that you truly internalise it. Only when you have truly internalised an object you can operate at a professional level. Internalised knowledge and insights are not a condition, they are the result of learning to deal with the complexity in your environment. It is the sum of how you develop and apply your human, social and decisional capital (Hargreaves 2012). Below is a description of the opportunities to give shape to developing sustainable professional capital.

**Learning to look, think and act differently is the essence of systems thinking**

Ask a group of people to look at a work of art or a passer-by and get them to tell you what they see; the range of observations will amaze you. Everyone looks at an object differently and because of the connections in their brain they will form a relationship with specific aspects which the person themselves thinks are important. See figure.

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**Figure: The pattern of attention**

- **stimuli**
  - reinforcing the important
  - suppressing the unimportant

- **thalamus**
  - 6x

- **visual cortex**
80% of the stimuli perceived by the brain are received via the visual system. The stimulus passes via the eyes to the thalamus, to the visual cortex and back again! This is the feedback mechanism which ensures that we pay attention and that we can focus on a specific situation or a specific object. The feedback can be six times more than what is received via the retina. This mechanism ensures that certain sensory neurons, which play a role in processing visual stimuli, transmit more or less active information. This means that information not related to the topic is perceived less, and certain specific and important information is passed on.

Our brain thus intensifies information and allows less of other information in. This is dependent on all sorts of variables such as emotions, experiences, concentration, energy, and mental models; in short all sorts of personal aspects which can be different for everyone. In order to learn to look at things differently, it is good to learn to accept as many different viewpoints as possible. One of the ways of doing this is by using the various perspectives of multiple intelligences (MI). Put the subject at the centre of the MI circle and for each intelligence, try to describe how you might view the subject from that perspective. Everyone has all these intelligences but some intelligences are more developed than others. This means that everyone can have a different perspective. If these perspectives are then shared, the participants notice that their perspective is additional and that they are learning from other people’s perspectives.

Based on the above, it is therefore very important to personally and jointly learn to differentiate between primary and secondary issues. ‘Mind mapping’ is an ideal technique for learning this (Buzan 2009). A mind map comprises a central theme and an arm for each key issue. The arm extends into branches with details. Each arm has its own colour and words and visualisation are used. Creating a mind map takes more time but repeating the mind map takes a lot less time and therefore enables you to prepare effectively for a test or internalise information.

The brain therefore has to learn to make your own thoughts relative and for that you need tools and a different perspective. Using a visual tool, the other person’s perspective or the environment you can develop a connection with an object and as a result further deepen your perspective and give shape and content to thinking differently. If you learn to shift to the other person’s or an environmental perspective, you also learn that you can think differently about things.

Education today is heavily focused on acquiring and being tested on theoretical information. The economy is often referred to as the ‘knowledge economy’. 900,000 people work in our craft economy across 250,000 companies. This is a considerable proportion of the working population. The big problem looking ahead concerns the ageing population and the expected lack of professionals trained in crafts. Working in crafts combines the head, heart and hands and is perfectly focused on sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability. Bringing children into contact with crafts at a young age promotes their passion for sustainability.
Learning to think differently is in part to do with thinking about and understanding cause and effect in relation to time and place. How can we better understand the intended and unintended effects of our actions in the short and long term, both nearby and far away? It is not a problem that children are not yet able to foresee the possible consequences of their actions and they cannot yet plan effectively (Jolles 2010). Consciously and unconsciously making a choice and facing the consequences of this choice are important experiences that will create connections in the brain. A safe environment is an important yield from the experience but also a condition for future learning processes. The big problem with the current education system is that children have to work with a uniform and imposed schedule, even if this is not what they choose or what matters to them. This insecure situation has a dramatic effect on the brain’s effectiveness.

Learning to make a choice and learning to reflect on the consequences of this choice are skills on which there is little focus in the current educational system. The opportunity for making choices and planning by the children is influenced primarily by planning of the curricula and the time available. Working with multiple intelligences gives teachers opportunities to generate cognitive results both directly and indirectly. Directly via existing materials and methodologies. Indirectly by processing the curriculum via different intelligences, coupled with children’s choice of which activities they want to do first. The quality of reflection is an important variable in influencing thinking. The faster feedback can be collated, the greater the chance of deep learning processes. Children themselves need to be able to give shape to the feedback on their learning process. Only then will learning deliver optimum results. The student needs to personally assess which variables have had an important impact on the result achieved. Whether the student can be happy with this depends on the objective that the student has set himself or herself. This means that for the student, having a choice is again a very important variable. Having the autonomy to make a choice, developing the mastery to make that choice count and finding the purpose to make that choice meaningful. Collecting feedback is an important part of the learning process but is often accorded too little time. During reflection too, you can jointly choose to adopt as many different perspectives and methods as possible so that you can consider the reflection on the subject from different perspectives.

Acting differently can be based on seeing things differently and thinking differently. Different tools and ways of working can be used to elaborate a topic. The example in figure on page 33 demonstrates that children looked at the surface area and circumference from different perspectives. They then start to work on the topic with tasks under each of the intelligences. Doing mathematical exercises is addressed only at a later stage. The various tasks give them greater insight into the topic, and they find doing the mathematical exercises easier afterwards. This is an example of first developing interconnectedness from different perspectives and deepening this with methods and activities which subsequently ensure a better understanding of what you are doing.

If information is placed in meaningful experiences, the relevant knowledge will be stored in the long-term memory. Meaningfulness is increased through experiences, through positive emotions associated with the subject and by being able to choose the activity yourself. The more experiences someone has, the more new knowledge can be connected to previous experiences. Learning to see, think and act differently means that the personal framework of reference grows and this framework of reference forms the basis for actions in the future. The most important objective of school could be to help children in developing their personal and shared framework of reference so that children learn that they know what to do when they don’t know what to do. This would be analogous to helping them find their personal equivalent of the triangle, the dice, and the heuristic.

Optimum development as a systems citizen (Barry Richmond 2000)
The intention is not to place the burden of sustainable developments on the shoulders of children. Children need a safe and rich environment in which they can choose for themselves which activities they want to do. It is up to us as adults to optimally encourage and stimulate children in order to facilitate optimum development. To create the principles or rules that will enable the “natural order” that is within all human beings to emerge. Children learn naturally from a young age. They interact with their environment and are stimulated to learn by their relationship with the environment. The mirror neurons are an important part of this (Lacoboni 2009). The brain observes
the behaviour of another brain and the same stimuli then take place in the observing brain as in the acting brain. This creates a track in the brain which facilitates action. This is known as copying behaviour. If feedback is then received from the environment, students will further adapt their behaviour to their own version. This is an important argument for working with heterogeneous groups as far as possible. Up to the age of 10, children learn the most via their mirror neurons. One of the problems with education in The Netherlands today is that because of the low numbers of male teachers, boys in particular see less of the exemplary behaviour that fits with boys’ specific features of development. Acting sustainably as a systems citizen must therefore be evident to children if we want the mirror neurons to leave enough tracks in the brain. Furthermore, it is very important for the brain that information is meaningful, that there is a positive emotion connected to it and that there are concrete experiences. At a certain point, children are more open to what is happening in their environment both close by and far away. They have learned a lot and increased their human and social capital. They have been able to practise their decisional capital and we expect them to convert this into professional capital at a certain moment. But this will progress optimally only if you can practice safely at a young age in parts of the adult world.

An example. Children in kindergarten work with the connection circle on a story from a picture book. Through play, the children learn to deal systematically with cause and effect. In 5th grade the children work on a problem in the playground. They play the game ‘dissing’ with passion but it always ends with problems and arguments. They also use the connection circle and after some time they together come to the conclusion that they will not play the game any more because it constantly ends with problems and arguments. We often tell children the solution to a problem and expect them to stick to it but it is important that they have to grapple with the problem using a tool that facilitates thinking and collaboration so they will understand it themselves. The next step is that they use the tool they have learned for a new, meaningful question that is more connected to the world outside school. In the Ministry of Economic Affairs example (see chapter 10) children were asked what they thought about renting animals. The children first explored the question to understand what it was really about. They next examined and explored the question from as many different perspectives as possible. In part by using the connection circle, they developed a deeper understanding and gave a well-justified recommendation for new legislation to be drafted.
The above touches on the didactic structure of professional capital. If we expect adults to have sufficient professional capital at a certain point so that they can make a meaningful contribution to a sustainable world, this must be structured in a didactically responsible way such as we do with maths, language and reading.

One of the nice effects of this way of working is that adults who put a meaningful question to children get a rich return on their question. Children are better equipped than anyone to get to the essential core of a subject. This is to do with the fact that the children’s rational brain is not yet fully grown. They are not so easily diverted from the essence of the matter by rationalisation and assumptions. They are, as it were, open to new insights.

The example of Ryan’s Well shows how a child can be affected by the idea that somewhere far away, someone has to walk miles to fetch water, and this person then sets about getting clean drinking water for the village. This happened thanks to and despite the adults - he would not be diverted from his aim. Not every child will tackle such a big problem, but we can teach every child the knowledge, insights, skills and tools they can deploy to understand what you want to achieve in your life and what you can do to get there.

If I know where I want to get to, motivation is no problem. Sef Vergoossen

A few years ago aircraft manufacturer Boeing, in a quest to optimise quality, tasked all its employees with naming some variables that had led to Boeing’s success and variables that were associated with the problems at the time. In this way, they collated around 200 variables and connected them together using systems thinking. See detailed image.

By connecting the variables in system loops, the three most important variables become clear. These were the variables which were able to move the most other variables towards the desired future. This enables a major innovation to be achieved within a period of three years.

In this way, youngsters learn to understand the complex story in the picture book. Then, using the articles in the news, children learn to understand complex stories which have greater connection with reality. At a certain point children need to face real world problems close by and far away, in the here and now and in the future, so that they get carried away with it and their passion and engagement mean they cannot be stopped.

By grappling with a problem, children learn independently and together what is needed in terms of knowledge, skills and attitudes, and apply their knowledge and abilities. They learn what is needed to solve the problem. This experience is accompanied by meaning and emotion and then becomes anchored in the long-term memory. In this approach, we see personal learning styles unfolding and children learning how to work with their head as well as with their heart and hands. It is a good idea to set an exam to test partial skills using a valid instrument. But most importantly, we should not forget to teach children to see what they believe is truly important and what they have done to achieve this. At any phase of their development, children can create a masterpiece that shows who they are and what they are capable of. It is desirable that we as adults give the children a broad selection of social topics to choose from, and then also offer them the freedom to choose a topic that they want to work on.

20th century thinking dictates that you must learn to think linearly before you can learn to think cyclically. Children show us that this perspective no longer applies in today’s times and with today’s insights.
One of the variables that play a part in maintaining the system is routine. Together with innovation, routine is one of the most important aspects of survival for the brain. Working in education is one of the most complex professions which makes routine all the more important. Teachers need routine to maintain an overview and to be able to anticipate the constant movement and dynamics in the classroom and the child’s world. If routine is no longer working, innovation is needed. This means that we must very consciously learn to maintain routine in a different way. Only if teachers are able to convert innovation into new routine will change become anchored in the system.

If we want to give children the opportunity to learn how to resolve complex problems which play a role close by and far away in time and place, we will need to make this one of the most important cores of the eco-social educational system.
The education system of the future
The education system of the future
Establishing a new theory is not the same as pulling down a shed and putting up a skyscraper in its place. It seems far more like climbing a mountain, whereby we see new and expansive view and whereby we discover unexpected connections between our starting point and its rich environment. Albert Einstein

This publication is not about scrapping the old educational system and replacing it with something new. How can we understand the educational system of the past and become open in the here and now to emerging opportunities and thus lay the foundation for the educational system of the future? We need to have the perspective of a holistic view. There are so many rich perspectives, frameworks and concepts and the integrated brain immerses itself in interconnectedness between the various perspectives to learn to understand the unfolding opportunities that are presenting themselves. First of all, some children give their perspective on their life and at school in 2028. In addition, if we look and feel with an open mind and heart, we see unfolding opportunities which anticipate potential developments in the future. What developments and emerging opportunities can you see to enable children to achieve the future they want to create?

name: Larissa
age in 2028: 28
Profession in 2028: in-house architect
School: I think that all the blackboards will be gone and that every student will get a laptop from the school that they have to give back at the end of the school year and that primary school children will start learning to read and right earlier. Important for school in 2028: That the Government doesn’t make cutbacks on schools and that children learn 2 languages at primary school, for example English and French so that they have the basics when they move up through school.

name: Emma-Rose
age in 2028: 26
Profession in 2028: artists, graduated from the Academy of Art on my 22nd birthday on 10 May.
School: A lot of colour will be used. Virtually everything will be digital. You will attend school until the age of 18 and will start at the age of 2. There will be 15 grades. You will have elective subjects and standard subjects. You will be able to determine your own school times but will have to attend school for a certain number of hours.
The subjects won’t have changed. Although there will be some new ones like technology and care & well-being. Fascinating, captivating Education’ will still be in place. This approach will be used more, in all schools.
name: Thomas  
age in 2028: 27  
Profession in 2028: lawyer  
School: LKZLML (Leer Kinderen Zo Leuk Mogelijk Leren - Teach Children to Love Learning). Solar and wind energy will be used. TV will make learning more enjoyable and easier to retain. Lessons will be delivered on your own TV. There will be no primary school, just secondary school from the age of 8 through to 18. There will be a chill-out area to use in the breaks. Comfortable chairs. Everything will run on solar energy, electric cars, more recycling and a solar-powered microbot. The building will have 5 stories: 1. Creative, 2. Dutch, 3. Languages, 4. Economics, 5. Maths. There will be a microbot parking area and you will be able to get your licence at school.

name: Jelmer  
age in 2028: 26  
Profession in 2028: care-worker with the elderly. There will be a lot of electronic machines and older people will find all these electronics scary.
School: School will be from age of 5 through to 15. There will be groups 1 to 10. Everyone will have an app that you can use to create graphic organizers. Everyone will have books on their IPAD. Classes will be taught by robots.

name: Suzanne  
age in 2028: 27  
Profession in 2028: Anything to do with clothing and furniture design.
School: There will be 5 departments arranged by age, from 5 through to 14. The children will have to achieve objectives. If you have achieved 18 objectives you will move onto the next department. Targets will be focused on your future profession. The building will be big and round.

name: Bloem  
age in 2028: 28  
Profession in 2028: Fashion Designer. I will be making clothes for pop stars. I will use a voice-activated sewing machine with solar panels and mini windmills. I will be designing clothes that no one else has.
School: The school will be sustainable: solar panels, windmills, etc. There will be a canteen. School will be from age of 4 through to 12. If your teacher says something, the whiteboard will type it out. There will be chairs for relaxing.

name: Trijntje  
age in 2028: 26  
A day in my life: 30 September 2028 I am another year older and I have adopted twins from Surinam. Today, I am going to work while my husband looks after the children. I fly to work on my flying saucer.

Profession in 2028: I graduated on my 21st birthday. I am a journalist. I have my own company. It is called: T&T news and handles all types of news.
School: I am looking for a school for my adopted children. The school has 10 groups. They offer standard subjects and elected subjects: Happiness, practical topics: cooking, crafts and sport. You have to allocate the material yourself over the year. Lessons will be delivered on a mega tablet. The building is large, round and flat and has a roof terrace and a garden.
Backcasting
Herman Rottinghuis (2008) uses ‘futuring’ to describe the combination between scenario planning and creating a vision, and turns this into a smooth process. It structures thinking about the future by means of a consistent process and makes us aware of the mental models which influence this process. You anticipate current developments and based on this you formulate a possible scenario. You then systematically work back from there to the here and now what steps are needed to achieve this scenario in a specific time scale. If we want to see a meaningful development in the eco-social educational system in 2020, we need to visualise the situation in 2020 right now. From this desirable perspective of the future, a scenario plan can be developed to turn the idea into reality. All the perspectives below, and most importantly those not yet added, can help to shape the picture of the future.

Ecological literacy
Daniel Goleman (2012) uses more socially driven ecological literacy to describe how we can learn to deal with a rapidly changing world. He states that from the viewpoint of emotional, social and ecological intelligence there are five vital applications:
1. developing empathy for all forms of life;
2. embracing sustainability as a community practice;
3. making the invisible visible;
4. anticipating unintended consequences;
5. understanding how nature sustains life.
He movingly describes how people feel responsible for the ecological development of their environment. He thus illustrates what adults can do and what we can teach children to jointly create a world that matters.

Laws of nature as a source of wisdom
In her book ‘Connected Wisdom’ (2008), Linda Booth-Sweeney explores a number of laws of nature that are comparable with Newton’s laws. In every community, there are agreements and laws which have been established to safeguard the quality of life. If we use transport to get around, we know that a red light is the signal to stop. In nature too, there are laws which we can follow as a guiding principle. There is no such thing as waste in nature. What one species sees as waste, another species sees as food. If we can learn to understand and follow the laws of nature, we can live sustainably without depleting natural sources.

She names 12 laws of nature:
1. interdependence: a relationship in which each partner affects and often needs the other;
2. systems integrity: what a system has when all the parts and processes essential to its ability to function are present;
3. biodiversity: the variety, complexity and abundance of species that, if adequate, make ecosystems healthy and resilient;
4. cooperation and partnership: the continual process in which species exchange energy and resources;
5. rightness of size: the proportions of living systems – their bigness or smallness and their built-in limitations to growth – that influence a systems stability and sustainability;
6. the commons: shared resources - such as air, water, land, highways, fisheries, energy and minerals - on which we depend and for which we are all responsible;
7. living cycles: circular processes that repeat over and over, frequently returning to where they began. The water, lunar, sleep and other cycles sustain life, circulate resources and provide opportunities for renewal;
8. waste = food: when waste from one system becomes food for another. All materials in nature are valuable, continuously circulating in closed loops of production, use, and recycling;
9. balancing feedback: circular processes that create stability by counteracting or lessening change;
10. reinforcing feedback: circular processes that create
growth or decay by amplifying reinforcing change;
11. nonlinearity: a type of behaviour in which the effect is
disproportionate to the cause.;
12. earth time: the pace of biosphere, that is, the pace at
which life occurs for all living organisms.
The work of Goleman and Booth-Sweeney shows us that we
can use the sources present in nature in a way that fits with
the essence of nature.

From our mission statement:
“Empowering young people to take real action
to stop deforestation by embracing 21st century
learning using the best technology”.
We encourage children to be the leaders of today
and not just the leaders of tomorrow. “It is their
world, their life, their only chance of survival. It
is all-defining and so they need to be involved
and not just be caught up in a flow of routine (current educational system) but instead play a
proactive part in our planet”.

Children/schools can join up with
‘Earthwatchers’ and collate information about
an area and the process of deforestation via
deforestACTION and the use of satellite images.
These images are shared via contacts with the
local population, allowing the local population
to have direct intervention and prevent further
deforestation of the environment they live in.
Furthermore, children in Borneo can own a piece
of woodland or plant a tree. Cameras mounted on
towers and transmitted by satellite once a week
track the growth of the trees and the forest. Each
week, you can measure how much your own tree
has grown by and the effects of this growth on
the forest.
Research carried out in collaboration with
Microsoft and National Geographic involving
10,000 children revealed that a large majority of
the children believed that deforestation is the
biggest problem of these times and needs to be
addressed. Willie Smits
See www.deforestaction.org

Awareness of the source from where
you act
In his ‘Theory U’, Otto Scharmer (2009) describes a meth-
odological approach to connecting with a problem, a situation
or a development. As part of this it is possible to learn from
the past but also from an emerging future. He first focuses
on awareness of the sources that drive actions. What is your
blind spot, are you aware of it and what impact does it have
on your actions? Alongside an open mind he places an open
heart and the will to do what matters. By following a num-ber of steps you can work and observe in a methodical way
so that independently and jointly you can gather as much
information as possible. You then need to ask yourself what
aspects of this information are important. What can we let go
and should we embrace to get to the core and see what really
matters? If, as Scharmer describes it, you go through the eye
of the needle and really get to the core, it is clear what you
need to do. It leads to experimentation, and reflection on this
experimentation increasingly leads to the essence of what
can and must be done. This methodical approach enables
you to create a connection with a situation, and this learning
process leads to development. The methodology is designed
for leaders and organisational development, but can equally
be applied to any educational and pedagogic setting. It is a
methodical way of working which, together with a number of
other aspects, can deliver much higher yields.

Professional development of the individual,
region and country
In “Professional Capital”, Andy Hargreaves and Michael Fullan
(2012) together convincingly describe how regional, national
and global development is possible only if we can raise the
quality of education. You develop professional capital by in-
vesting in “Human Capital”, “Social Capital” and “Decisional
Capital”.
Human Capital is about individual talent and possessing and
developing appropriate attitudes, knowledge and skills. One
of the most important variables in personal development is
learning in a team context. This is known as Social Capital.
A group based on trust learns more, which is reflected in
greater returns. Social Capital allows you to maximum use of
the available Human Capital. Learning is hard work and Social
Capital is the fuel it needs. The essence of professionalism is
the extent to which we are able to take responsible decisions,
which we call ‘Decisional Capital’. You acquire this through
lasting structured and unstructured experiences, exercises and reflection. Personal learning (Human Capital) brings greater depth while learning from other people (Social Capital) accelerates learning and both are an integrated part and a complement to Decisional Capital. It takes 10,000 hours to become a real expert in any profession, and the key to it all is lots of practice. We recognise this in music and sport where we know that it is good to start as young as possible. Education in recent decades has seen investment primarily in transferring knowledge so that the student can apply this knowledge in a profession at a certain moment. Throughout the period of compulsory education, we can increase the potential for Decisional Capital by giving children a choice in a safe and appropriate environment. Experiencing the effects of this choice triggers learning, depending on the quality of reflection. Learning from your own experience and that of other people with a view to better learning to make decisions that matter (for yourself, other people and the environment) is one of the most important variables for optimum development.

Five minds for the future

Howard Gardner is renowned for his research and publications on multiple intelligences. An important additional perspective on intelligence and learning. Following years of in-depth research into understanding the brain he shifted to the thinking that is needed in the future. He described this in ‘Five Minds for the Future’ (2006).

The disciplined mind is about expertise in a specific discipline and looking for greater scope and depth in personal expertise, about really knowing all the facts. It manifests itself in keeping up-to-date with new developments and feeling the need to give shape and content to personal growth with respect to the discipline. As part of this, we can give maths, language and reading the emphasis they deserve.

The synthesizing mind is about being able to see, clarify and create context. This means context within your own discipline as well as context with other disciplines to thus create a whole. Seeing, understanding and giving shape to the fact that the whole is more than the sum of its parts. Understanding complexity not just by dividing it up into small parts, but by seeing the whole.

The creating mind enables you to create something new from the depth of one or more disciplines and the skill of seeing and understanding the interconnectedness; the ability to think outside the box and strike out on new paths.

Creativity is an important building block for development. You can be trained in it by adopting a different perspective. This takes time, attention and space. When solving problems, it is often about thinking ‘out of the box’. Creativity also demands a more open approach whereby you break the mould and redefine the frameworks. Children are naturally creative. They may become the owners of our social environment and we can build on that by introducing habits and competences appropriate to this time in an organised way.

As an example: think up a narrative for sustainability. We will call ‘eco-chic’. Nelly van der Geest

The respectful mind is focused on respecting other people, seeing and celebrating the diversity of the universe, seeing differences between people and groups as an opportunity to learn from one another rather than as a threat.

The ethical mind is about doing what matters and not just what works; about making the difference and seeing the difference; about what people do when they achieve ‘good work’ where quality, a sense of responsibility, engagement
and meaningfulness play a role. The emphasis on maths, language and reading at a didactically responsible level is important, as indicated above. In recent years we have developed a high level of educational professionalism with respect to these areas. In the educational system of the future there must be just as much didactic responsibility dedicated to development of the synthesizing, creating, respectful and ethical mind of every student.

The importance of architecture in a change process

In their Cradle to Cradle (C2C) concept, Braungart and McDonough emphasise the importance of the architecture of innovation. The architecture of the system largely determines how the process will progress. The existing architecture influences thinking (and vice versa) and actions with respect to this architecture; it keeps us prisoner as it were. Our brains see what we think and our thinking is shaped by what we already know. If we believe that it is logical that developing a product leads to insurmountable waste, we would never design anything that didn’t causes waste. The Cradle to Grave principle means that waste is still a problem but an unavoidable by-product of economic growth. What if we apply the principle of Cradle to Cradle and a product is only a good product if there is no waste associated with it? If we want to be guided by such ways of thinking, we need to start when the brain is at its most open to new ideas: as young as possible! C2C focuses primarily on products and product processes, but what if we want to use the full human potential without losing anything? What society do we want to see 15 years from now? How, in the architecture of the process, can we bring together interconnectedness the developments that matter so that we can achieve what we really want?

We thus need innovative thinking and innovative architecture to enable us to move away from the well-trodden paths and develop innovatively. This innovative architecture focuses not just on structural elements but also primarily on cultural elements and the connection between the two. In chapter 9 ‘What could be changed?’ I offer a perspective on the possible design of education based on the architecture of the building, the learning process, the curriculum, the leadership and the community.

A new framework for teacher competences

In addition to the innovative structure, we also need an innovative culture. How can we develop our behaviour as professionals in proportion to the changes being organised? What competences will teachers of the future need? The Environmental School Initiatives (ENSI) scheme provides insight into the competences of teachers in a sustainable school. The generally applicable competences are focused on teachers as an individual (development as a human being), as teachers in an educational institution (development as a professional) and as teachers in society (development as a systems citizen). In the professional dimensions teachers must be able to deliver high quality lessons, be active participants in networks and have a good capacity to reflect and to (help to) develop vision. The learning processes for sustainable development are focused on orientation in time and place. This means that teachers are able to connect with the effects of actions in the short and long term, both close by and far away. They constantly focus attention on develop-
ments in the areas of knowledge, systems thinking, emotions, values and ethics, and focus on active participation.

Of the domains in the ENSI system, the ‘knowledge’ domain has been well elaborated in the current educational system. The remaining domains demand major investment over the forthcoming period because they have not been sufficiently developed. Of the professional dimensions, teaching gets the most attention. It would be good if in the future there can be balance between the time spent on teaching and the time spent working in networks, developing vision and reflecting.

In concrete terms this means focusing attention from kindergarten and grade 1 on the areas of knowledge, systems thinking, emotion, values, ethics and action.

Central to this system are the opportunities for the professional to see actions in the context of time and place. Am I aware of the intended and unintended consequences of my actions in the short and long term both close by and far away? This awareness is an important competence for teachers in the 21st century.

**2020 Forecast: Creating the future of learning**

The 2020 Forecasts suggests that new agents of learning will help shape the future of learning by contributing to the expansion and redefinition of the education profession and its relationships to, and roles in, community life.

There was a 2020 Forecast done about education for the KnowledgeWorks Foundation (www.knowledgeworks.org) and The Institute for the Future (www.iftf.org) that highlighted the following “Learning Agent” roles:

*Assessment Designer*

Using social networks and insights into cognitive functioning, assessment designers will create appropriate methods for evaluating media literacy, learning discovery journeys, and other innovative forms of instruction.

*Community Intelligence Cartographer*

Community intelligence cartographers will tap the collective intelligence of their local communities. They will leverage social networking strategies to develop swarms and smart mobs in order to identify emerging learning opportunities in the community, organize community members, and locate community resources.

*Edu-vator*

Edu-vators will build platform prototypes, experiment with new tools, evaluate new practices, and generally explore innovations in the learning sphere. They will team with learners, who will get credit for being in “edu-vation workshops.”

*Education Sousveyor*

Education sousveyors will keep the learning process transparent and will stimulate public discussion around it. Through mechanisms such as blog posts, pictures, podcasts, and videos, they will keep learning on the forefront of stakeholders’ minds.

*Learning Fitness Instructor*

Learning fitness instructors will help learners build and strengthen the basic cognitive, emotional, and social abilities essential to learning by using simulations, biofeedback, and hands-on activities to reduce stress, hone mental capabilities, and learn brain-friendly nutrition.

*Learning Journey Mentor*

Learning journey mentors will work with personal education advisors, learning fitness instructors, community intelligence cartographers, and assessment designers to co-create and navigate learning itineraries with small groups of students.

*Learning Partner*

Students who test for compatible personalities but who have different cognitive strengths will be matched to support each other throughout the year, maintaining a constant thread amid shifting peer relationships.

*Personal Education Advisor*

Assigned by certified local education agencies, such as schools, resource centers, and libraries, or selected and contracted by families, personal education advisors help families create, nurture, and maintain personal learning ecologies.

*Social Capital Platform Developer*

Social capital platform developers will link the social capital infrastructure to teaching and learning practices and outcomes. They will use tracking programs to provide an
accounting of people’s contributions to open education resources and collaborative processes. If we recognize the urgency in creating new systems and structures, I believe there must be more than the traditional roles in that new system. Teacher Training Programs will have an important role in this process.

**Sustainable School for Teacher Training**
Based on the UNECE 2011 document (United Nations), the Sustainable School for Teacher Training established a set of competences for ‘Learning for sustainable development’. There are 4 categories based on a wide range of learning experiences:

1. learning to know refers to understanding the challenges facing society both locally and globally and the potential role of educators and learners (the educator understands…);
2. learning to do refers to developing practical skills and competences in relation to education for sustainable development (the educator is able to ….);
3. learning to live together contributes to the development of partnerships and an appreciation of interdependence, pluralism, mutual understanding and peace (the educator works with others in ways that….);
4. learning to be addresses the development of one’s personal attributes and ability to act with greater autonomy, judgement and personal responsibility in relation to sustainable development (the educator is someone who….).

Each dimension is represented by essential characteristics of Learning for Sustainable Development:

» a holistic approach, which seeks integrative thinking and practice;
» envisioning change, which explores alternative futures, learns from the past and inspires engagement in the present;
» achieving transformation, which serves to change in the way people learn and in the systems that support learning.

Both perspectives are well aligned with one another. They also make the connection with the current educational system concrete. Every organization can use these insights to reflect on its own organisation and develop a vision for the future.

**Rethinking the curriculum**
The curriculum occupies a key place in the architecture of education today. As described previously, the curriculum has been divided to perfection into separate parts which must each be closely monitored so as not to disrupt the didactic structure. Teachers can see each day what steps need to be taken for each subject. At the end of the year, most of the curriculum is taught. But the question is whether the children have been able to connect with the subjects in the curriculum. The existing curriculum can no longer be used in the same way. Teachers will use a mind map to be able to extract the primary and secondary issues from every part of the curriculum (Buzan 2009). Teachers also need to be able to connect meaningful subjects and topics with the curriculum (Oosterling/Griffioen 2012). Innovation in methodologies will in the future need to be more closely aligned with the innovation that is needed in education. The methodologies thus become a tool for innovation of the educational system and not simply a means of getting the curriculum across.

The world is becoming smaller, we are developing a wider global perspective and we are becoming increasingly aware of the world around us. It is important to make children aware of their behaviour at an early age. Bringing things close to them and keeping it small can achieve this. Digital media can play a major role in this. For example an e-manager can be used to record energy consumption when you take a shower. The direct feedback from the e-manager is an important source of information. Big and small issues come to life when you have to think about them. You need leverage to scale up this process so that all children can use it. There is a shortage of technically trained people. How can we encourage children to be more fascinated by technology, closed cycle thinking and perspectives such as C2C? In my view, the curriculum plays an important role in making innovation scalable. Hub Morelisse, NUON
HOW DO EDUCATION WORK TO
How does education work today?
You don’t learn for school, but for life. Seneca

To achieve education of the future, we need to understand where our current educational system originates from, what sources have led to it and what will happen if we continue to use the same sources.

The scientific, social, economic and political developments over the past 250 years have been characterised by the industrial revolution and machine thinking with key topics such as productivity, uniformity and fragmentation. This has led to a global view where we assume that if you have analysed the parts of a system, this system will be just as predictable and manageable as a machine. The scientific insights, social circumstances and technological developments of the industrial age have led to fabulous solutions to the problems of this age. Thanks to developments with the assembly line in factories, productivity in textile factories increased by a factor of 120. Education was designed on the basis of the same successful principles. In addition, the role of education at the time was to prepare children for work in the factory.

It has brought us a long way and is still a valuable source. We can choose to make use of it or not. But we now live in the 21st century where different developments play a role. The increase in the global population and the use of raw materials is not balanced with the possibilities of our earth. The way we live is going to change. It is just a question of whether we will go through this change as victims or as architects of the process.

The role of education in the 21st century is to meet the need to see, think and act more sustainably. The world has always been very complex but we are now becoming increasingly aware of this complexity. If we continue to approach complexity with linear thinking (simple cause and effect thinking) the gap between increasing complexity and understanding of this complexity will quickly become bigger. The bigger this gap becomes, the less sustainable our current way of life will become. See the behaviour over time graph below (Peter Senge 2012).

It is important to investigate whether this assumption really makes sense. For the moment, I want to assume that a major variable in this system is the limited degree to which we teach children to deal with complexity and interconnectedness. Education today is focused on linear thinking which means that we do not stimulate students’ brains enough to create as many connections as possible - and that during a period in which the learner’s brain has optimum opportunities to create as many connections as possible.

Creating as many connections as possible in the brain and creating as many perspectives to a situation as possible isn’t an aim in itself. It is an attitude of getting to the core, of learning about, of understanding and retaining the essence, and of internalising.
Children build a bridge from the characters that they know to the words they can form with them. They take the Dutch combination of characters ‘EEUW’ which can make spelling difficult and then create words and write and draw these words to combine the left-hand and right-hand side of the brain. The means and the aim are consciously connected. What happens if we place all the innovative developments from this chapter on the left side of the bridge? What can we do with them, how can we use them to change education?
WHAT COULD BE CHANGED?
ULDGED?
9 WHAT COULD BE CHANGED?

The whole is more than the sum of its parts.
Aristotle

Given that our brain finds it difficult to deal with changes not triggered by life-threatening situations or highly negative emotions, we need to give the brain a helping hand. We find this help in the emotional brain by lingering over what we truly think is important, by connection with passion and engagement. The rational brain can help by devising a powerful architecture for the developments. The two should preferably operate integrally. In accordance with the thinking of the C2C principle, it is important to redesign the architecture of the educational system with a view to optimum development of all concerned. There clearly needs to be investment in an eco-social educational system based on the following architectures:

The architecture of the building

The building can be designed with a living system as its example. The building promotes a deep connection with the curriculum, with yourself, with other people and the environment from as many different perspectives as possible. It generates its own energy, breathes in and processes CO2 into oxygen and purifies water. The concepts of C2C are elaborated as optimally as possible. Solar collectors for electricity, natural ventilation for optimum oxygen supply to the brain, rain water management and biological cleaning of waste water...

The building shows children how the technology in the building works so that children are fascinated by the technology. The architecture supports and corroborates the way of working and learning of everyone involved. The rooms can be used and designed flexibly. Some rooms are more specific and therefore more fixed in form and function. For example there are specific areas in the building for reflection or contemplation or which lend themselves more to art or movement.

The building stimulates the development of connections in the brain. Children see and experience technology because all the technical aspects are visible and not hidden behind walls. In addition, the architecture of the building activates the other architectures. The building’s layout allows children to see where they can work together, in what aspects leadership can be demanded and how the environment is involved in learning. The architecture of the building is not dependent on a programme of requirements that is primarily attuned to the financial framework, but rather to the entire framework of reference which is the foundation for optimum development.

The architecture of the learning process

Education is fascinating to children and to everyone involved. If it is not fascinating, you will never have high quality education. The children develop basic skills, insights and attitudes which allow them to develop optimally during their years at school. The essence of the learning process is focused on developing a deep connection with the curriculum, yourself, other people and the environment from as many different perspectives as possible.

Children work independently and together on problems that are meaningful to them and thus discover that they can be meaningful to the world in which they live. They are responsible for their own learning and jointly responsible for learning of other people and the environment. By working on meaningful problems, they discover that they need specific knowledge, tools and resources. These are offered and internalised as part of a programme. Children learn by developing a connection with a problem or curriculum from as many different perspectives as possible. As part of this, having a choice is an important variable. Given this opportunity of choice, children are more motivated to get to work. The teachers inspire the children with a fascinating story, they support and coach the children and ensure that they develop a connection with the curriculum. By applying their own experiences, the children have a better understanding of the more abstract and cognitive parts of the curriculum. Reflecting on the learning process becomes an important tool in deepening the learning. Organisations outside of education (the community) present the children with complex questions they themselves are grappling with. These complex problems may be meaningful situations for the children, situations they want to work with. Working with the problems, they develop insights and perspectives which they in turn share with the organisations. This creates an exchange in which the biggest returns may be for the children. They learn that their perspectives on the problem can be meaningful to the ‘world of grown-ups’. In their minds they realise that they are able to understand and influence complex issues.

The power of the coach is in raising the quality of the individual without endangering the team. This can be achieved by keeping the individual fit and optimally exploiting the person’s specific qualities to serve the team. Sef Vergoossen
Peter Senge’s Architecture and Essence of a Learning Organization framework highlightens the need to have both “halves” of Organization Architecture and the Deep Learning Cycle designed into the new educational system. Through the lens of this framework most current efforts are focused almost exclusively on the Organization Architecture part and largely neglect the Deep Learning Cycle part. So, it is no wonder we have disengagement and dropouts. We need to engage children in their own Deep Learning Cycle, otherwise, no amount of curriculum reform, standards, teacher training, etc. on the Organizational Architecture side will have much enduring effect.

The architecture of the curriculum

“Knowledge as means for existence” Antonio Damasio (2009). Following on logically from the architecture of the learning process, the curriculum will also need to be modified to enable students to develop a deep connection with the content, themselves, other people and the environment from as many different perspectives as possible. It is about connecting them to their own Deep Learning Cycle. The curriculum is no longer the central goal, it is a tool. A tool for teachers to monitor student development and prevent children from working with problems which have too little connection to the curriculum but are enjoyable to work with. Furthermore, the curriculum expands because children need material currently not provided because of the approach to learning imposing. The curriculum will also expand because of the changing world around us. The entire curriculum is denoted by key objectives and instruction is available to every child via digital resources, remotely if desired. Alignment is achieved in the learning process and

With Erasmus University and in collaboration with the Board for Public Education Rotterdam (Bestuur Openbaar Onderwijs Rotterdam/BOOR) we have conducted research into the gap between the theory and scientifically proven principles of the psychology of memory and practical application in schools. (See Toolbox, Bouwmeester, S., Bruin, A. de. et al 2010).

This is bundled in 10 strategies divided across three groups:

1 remember better:
   » active rather than passive learning;
   » disseminate rather than impose;
   » retrieve from memory rather than learning anew;

2 understand better:
   » get them to explain;
   » get them to ask questions;
   » get them to make it tangible;
   » get them to read, let it sink in, get them to remember;

3 apply better:
   » focus on the approach rather than the solution;
   » decreasing support rather than ongoing support;
   » variation rather than uniformity.

You will come across many of these strategies in the materials developed by publishing houses, but in part because of market forces, there is greater emphasis on the delivery than on the strategies. Because of time pressures, teachers may elect to skip some of the method delivery or will not apply the strategies correctly. These are just some of the examples which may affect the quality of education. We need to carry more in-depth research into cognitive learning strategies, develop greater feeling for the strategies and raise the quality of reflection into how we apply these strategies in education today. Anique de Bruin
is no longer dependent on curriculum-focused instruction by teachers. Teachers provide instruction on the procedure of the learning process rather than on the content of the curriculum. The curriculum is no longer central, but is an important tool which can be used alongside all other information sources. The curriculum connects not just to the head, but also to the heart and the hands. Every aspect of the curriculum is connected to the more cognitive approach but also has a completely concrete connection with practical applications. What you can do with your hands you can understand with your head, and vice versa. The emotional connection is the most important level here. It is unbelievably important that the teachers connect with you, that your heart beats faster and that you have feelings about the subject. The connection ensures depth, because superficiality is not an option.

The architecture of the leadership
One of the most important conditions for achieving innovation is high quality leadership. Leadership that enables students to develop a deep connection with themselves, with other people and with the environment from as many different perspectives as possible. Innovation in the eco-social educational system is possible only if the leadership grows at the same time. The leader is the systems thinker in action. He enables leadership to be developed in the organisation and not just in one individual: sustainable leadership (Hargreaves 2006). Leadership is widened within the organisation by allowing those concerned to take on as much leadership as they can personally deliver. This also applies to children. Children are capable of far more than we think. Children are capable of consciously choosing which activities they want to do at what time of the day, working with who ever is most appropriate. This too is developing leadership. They can also develop the capacity to serve which can be seen as an important value in terms of decisive leadership and which may be present in every individual.

Leadership creates a safe environment and a learning context in which the learner can develop optimally as a leader. Leader in the sense of architect of your own life in relation to yourself, other people, and your environment. Depending on your own choices, you take responsibility for yourself, but you also take some responsibility for other people and for the environment. The most important task of leaders is to ensure that leadership remains when the leader leaves. The foundations of high quality leadership are learned from a young age and developed through experience and reflection.

“When education for sustainability is connected to community engagement, learning becomes intertwined with youth leadership development”.
Peter Senge (2010)

The architecture of the community
In the last century, the family was the cornerstone of the community. In this century, the community is the centre of our culture and our ‘global village’. “It takes a village to raise a child” is a well-known African saying. The idea of developing a deep connection with the curriculum, yourself, other people and the environment ultimately becomes evident in the extent to which we are able to achieve the community that really matters, small and large, close by and far away, now and in the future.

The world has quickly become bigger but the framework of reference has not grown at the same pace. Today’s system leaves children working with a 20th century framework of reference and they sense the gap with life in the 21st century. In this perspective it is not just the parents raising children, it is the entire community. The parents of course play a very important role and they all hope that the environment will take over their role with responsibility in relevant situations. In this process we need a shared framework of reference.

The future of our children (worldwide) is the most important aspect of sustainable development. It concerns developing citizenship in the sense of ‘systems citizens’. The society as the centre means that we are all important as stakeholders and that the quality of the community depends on the quality of collaboration within this community. If children learn to work well together, we thus create the basis for good collaboration within the community. We might also ask ourselves what ‘our’ community is? What does it include? Who is involved in the community that the school forms part of? We want to involve all the stakeholders as much as possible in the process. If, for example, a person in the neighbourhood has the time to work in the school gardens with the children to help them understand the seasons and how food grows and can be cultivated, this person may receive electricity in return to reduce their own electricity bill. This is possible because the school building generates more power than it consumes. The elderly can be meaningful in looking after children before and after school in the multifunctional school building they also live or spend time in. The opportunities for the community are unlimited.
It is not the intention to place the responsibility for a sustainable future on children’s shoulders, but rather to give children the scope to help them develop their sense of responsibility. We need to work towards a division of roles between school and home, with the teaching and development processes for children at the centre. Parents and teachers can help each other. It starts with a shared desire to work together to derive optimum outcomes from these processes. The dividing line between school and home is shifting, certainly with the advent of new digital developments. We should therefore enable both teachers and parents to support children both at school and at home to have dialogue about what they are learning. Children have the capacity and open-mindedness to translate knowledge into action, certainly in respect of sustainable behaviour. Because learning is easier than unlearning. This thus demands a coherent vision of the child in the learning and living environment, ultimately linked to choice of profession. But at the core, it is down to we adults to help children to develop a sense of personal value. Because the greater the sense of personal value, the more self-sufficient they will be and the more they will participate in society.

Princess Laurentien van Oranje (Missing Chapter Foundation)

Presentation about biofuel
10
REAL EXAMPLE
“That grown-ups are interested in us, That we matter.” Yasin aged 12

Collaboration between children and adults times and again proves highly enriching for everyone concerned. In practice, children seem disarmingly able to share insights which we know about to some extent but which we are still insufficiently aware of. Furthermore, children may confront us with the intended and unintended consequences of our choices. This is illustrated perfectly by Severn, Felix and Rembrandt, but there are also examples enough closer to home of children making a valuable contribution to developments. The examples below show how children and adults are able to work together on complex issues.

This is a story about ‘awareness’. Awareness of everything that is happening in the world and what that means to us as an institute, to students and to all the stakeholders around us. We show students that food gets thrown away, how much water is needed to produce one kilo of meat, the ecological footprint, the mental models that influence eating behaviour and what we can do about them. We make the students aware of what food we need and how to prepare it well. By encouraging healthy food you can change the world, and that is what our students do. It starts with yourself and then extends to your immediate environment. We enable them to experience that eating seasonal products is tastier, healthier and cheaper. We make the connection with every possible aspect of the ecosystem: economy, art, culture, healthcare etc. As such, our students become the biggest representatives of the change needed at this time and in this world. Marc Raaijmakers, Director Hotelschool Koning Willem I College and Marino De Bruijn, Head of Hospitality

1. Children talk about the school building of the future

The children themselves design a C2C school building to suit the times. To do this, they use the Circle of Multiple Intelligences. An architect then drew a design based on the children’s sketches.
2. Peter Senge and Global SOL meeting in Paris

The children in group 8 (grade 6) of BS de Duizendpoot work on subjects which they themselves have chosen for their contribution to the meeting convened by Peter Senge a few weeks later in Paris in the context of SOL-Global (Society for Organisational Learning) vision for the future. Two of the children’s topics are: children in politics and environmental lessons.

At the centre is the ‘Five Minds for the Future’ mind map. With respect to the mind map, the children use a range of tools which fit with the different minds. The ‘connection circle’ and ‘causal loops’ are used as systems thinking tools to be able to work on the synthesising mind. The ‘go to your corners’ helps to shape the ethical mind. For the creating mind, the children use a circle in which each of the five minds get a 1/5 share. They then use hatch marks to indicate the extent to which a specific mind is needed to approach the particular subject creatively. With respect to the ‘children in politics’ subject, they believe that the ethical and the respectful mind are the most important!

3. The Ministry for Economic Affairs, Agriculture and Innovation proposed discussing the following dilemma with children and asking for their recommendation: could an animal be rented to allow people to experience pleasure?

The children first researched information about what sort of animals could be hired and why. They then looked, thought and acted from the perspectives of the people concerned. This raised a number of key issues which they got to work on. By using various tools and resources, they were able to supplement their own perspectives with a well-founded recommendation.

Finally, the children submitted a proposal for legislation.
4. Sustainable School for Teacher Training (Duurzame Pabo) conference

On 25 January 2012, the children from the two groups 8 (grade 6) of the Public Primary School “Duizendpoot”, together with their teachers and parents, gave a presentation in Utrecht at the annual Sustainable Primary Education conference. When registering for the conference, all the participants were asked in advance to submit a dilemma with respect to sustainability. Some 10 participants submitted dilemmas and methods were devised with respect to these dilemmas which the children could use in order to get to work. The children sat on the stage working with the Sustainable Learning tools while the participants in the auditorium were given the opportunity to perform the same activities as the children. After a time, the participants were given the opportunity to discuss the dilemma and the method of working with the children.

The children were surprised that some of the teachers were not familiar with the tools and resources which they find so obvious. The participants were surprised at the ease with which the children use the tools and resources to ‘embrace’ a complex problem.

5. The Missing Chapter Foundation

Children from both groups 8 (grade 6) from the previous example also got involved in collaboration with the Missing Chapter Foundation (MCF). MCF was founded in 2010 on the personal initiative of Princess Laurentien van Oranje based on the thinking that decisions are more tenable and have greater value if they make room for children’s keen insights, logical questions and surprising solutions. The aim of MCF’s activities is on the one hand to encourage children to use their logical and creative way of looking at and thinking about things. By taking this seriously, children will do this more quickly and follow up their own behaviour. On the other hand, MCF encourages decision-makers and others to look at dilemmas and challenges by including the perspectives of children. This provides impetus to innovation and therefore competitiveness. In this context MCF took the initiative to establish the Council of Children to give children’s voices a permanent place.

In 2011/2012 the children from the two groups 8, under the flag of the Council of Children, collaborated with the Dutch theme park the Efteling. The Efteling asked the children to work with them on their dilemma: How can sustainability be associated with the Efteling in a fairytale way?

The children then set to work on the dilemma and carried out research from as many different perspectives and disciplines as possible. In 2012, they presented their observations and recommendations and, under the guidance of Princess Laurentien van Oranje they discussed these with the Efteling Management Board. Could sustainability sit comfortably with the typical Anton Pieck style fairy-tale experience? And would a visible role for sustainability not spoil the experience of ‘a day away from reality’?

This children agreed with the Efteling that the fairy-tale experience should not be lost, but it is self-evident to them that this does not need to stand in the way of sustainability.

As one of the children said during the dialogue session “Sustainability is life”. The children also established that the Fairy-Tale Forest and the theme park the Efteling were not the right place to visibly implement sustainable initiatives. To help the Efteling on their way with the issue of how to handle sustainability, the children visualised a proposal which the Management Board responded very enthusiastically to. This proposal looked at the possibility of designing a ‘play forest’ in which sustainability is central, so that children will be proud to visit the forest “because it is good for the world”. The forest can be laid out as an adventurous game with questions, tasks and experiences around sustainability. For example people can cycle in the forest to generate energy, rainwater will be collected to flush the bathrooms in the forest and there is a park detective to check sustainability in the forest. Some of the further details of proposal remain confidential.
The richest outcome in this case was the collaboration between the two groups 8. Both groups 8 are part of one school and connected to their own location and form part of two very different neighbourhoods. There is no contact between the parents and children in each of the neighbourhoods. This is because of geographical factors, but major social differences also play a part. These children’s totally different worlds came closer together. They got to know one another, developed a better understanding of one another and are looking forward to meeting up again in secondary education after the summer holidays. Friendships were made through the intensive approach of together grappling with an issue that is meaningful to the children and the adults.

6. SOL France

SOL France is associated with SOL Global which was founded by Peter Senge (2001, 2006). SOL stands for Society for Organisational Learning and focuses on supporting organisations in developing as a learning organisation. SOL France had come across the methodology of working as described in the examples above and wanted to arrange an inspirational meeting for its members about collaborating with children. One of the participating companies was prepared to submit a dilemma. The company has customers in 40 countries and is noticing that limits to the organisation have been reached. The CEO submitted a proposal for innovation of the company which the shareholders rejected. The shareholders wanted to restrict investment and achieve growth within the current boundaries.

The children first explored in a general sense what sustainability is from as many different perspectives as possible (multiple intelligences). They then studied the company’s story via ‘reading with comprehension’. It appeared to be a difficult story. Via the company’s website and additional short films, an increasingly clear picture of the nature of the company and the dilemma emerged. By using different tools such as the iceberg of systems thinking and the ‘Five Minds for the Future’, the children processed the dilemma and formulated a recommendation. Processing the information rationally did not work. By approaching the information from different perspectives, they developed a connection with the information which brought understanding and insight.

The recommendation was presented to the members of SOL France on behalf of the children. The participants were deeply impressed by the fact that the children were able to develop such a succinct understanding of the company over three afternoons. The CEO was very enthusiastic about the children’s recommendation and said that he would use the children’s materials to start new discussions with employees and the shareholders.

The children felt honoured by these developments and were delighted to agree with the CEO’s request to stay in contact.

This project lasted for six weeks. The children usually choose the topic together with their teachers. This time, we asked to supplement the project with a subject that was important to the Physical Integrity project. In addition to judo, cooking and gardening, the children also had ecosophy lessons. The practical reason for this is the gardens are very beautiful from the month of May and we wanted to grasp the opportunity to move to a more ecosophic approach. In addition to philosophy, ecosophy comprises nature and environment lessons and peace lessons. During this period, the nature surrounding the school was thoroughly researched. The underlying strategic reason is thus to shift from philosophy to ecosophy, in which your own - local - environment is discussed in the perspective of global events. The judo line and cooking line focus on the bodily aspects of physical integrity, the philosophy line opens up via the eco-line — at the end of the day the sun is there for everyone — the view from a global and cosmic perspective.

It is all about the proportional diversity between conflict and care. Judo, cooking and gardening connect the children in a bodily way: on the mat, the children learn how there are limits on their bodies and energy, just by burrowing in the ground they literally come into contact with eco-systems, in the kitchen they learn to take good care of each other and themselves. The aim of philosophy is to make this physical and socio-emotional learning objectives explicit in a cognitive way. Philosophy is therefore a sort of intervision. But philosophy is of course also a skill: listening to each other and the ability to express what you are thinking effectively.

Ecosophy starts with the student’s own interests. Semantic fields are used and the teacher has primarily the role of coach. One of the aims of ecosophy is critical insight into connectedness. Ecosophy is about ‘wisdom (sophos) of the house (oikos) as the hearth of connectedness. Ecosophy is a philosophy of relationships and connectedness, of interest and respect, but also of dealing with power. Conflict and care, the axes on which people act and negotiate mesopolitically. The project started with the gardens. The children of the school (grade 1-3 and grade 4-6) got to work on this, supported by the eco teacher and gardens manager Gerrit. Each child has different questions they want answers to. What species are there? How do plants grow? And what
about the trees? What do you need to do to maintain them? Are they all edible? What sort of soil do they need? Are there any animals in the gardens? These are the observational what questions. It of course gets interesting when these become how questions, and even more interesting when they become why questions. This is where philosophy comes in and subsequently ecosophical relationships: cause and effect, but primarily part/whole. We are forging somewhat ahead with group 6 and secondary education. We start with the question: What flowers are there in the neighbourhood? Supported by the schoolteachers, the specialist teachers and teacher students, the students map out the greenery in the neighbourhood. Where are the trees? And the plantations? What species of trees are there in Bloemhof? How does a tree grow? Are there a lot of trees and bushes? What species are they? And what sort of animals are there in Bloemhof? They are asked the same questions in the gardens as in the classroom. But as soon as we ask whether the plants and trees are healthy, a new aspect comes into focus. ‘Healthy or not’ can be decided only if a relationship is reflected on. Healthy for what? For itself or for me? And what effects are important to health? And perhaps the most confusing question: why is Bloemhof called Bloemhof?

To ensure the best possible alignment between the ecosophy lessons and Nature in the Neighbourhood, the eco-teacher, the gardens manager and the teacher work intensively together. They forward the ecosophical type questions which occur when working on the gardens, in the classrooms on Thursday afternoon and the ecology lessons on Friday to the philosophy teachers. They use these questions during the ecosophy lessons on the Wednesday afterwards. An ecosophy lesson lasts for three quarters of an hour. So the issue is to bring ‘nature’ into the classroom using other media. ‘The Earth from Above’ by editor/photographer Artrus Bertrand provides a series of images of eco-systems. There is a brief introduction to the topic which sets the tone. The first lesson is general in nature, the second, third and fourth are more thematic: ‘The Sun and Energy’, ‘Survival?’ and ‘Eco-systems’. The content of the last two weeks follows out of the first two weeks. Because the students on this project present the final outcome per result, we do the same with respect to ecosophy. The end result is an essay which the children write in the final two weeks of the project based on their own findings.

Transfer from example to a more systemic change

The challenge is how do we move from individual, anecdotal events to an integrated system design that does this on an ongoing basis? With the ever-increasing availability and capabilities of 3-D printing, just imagine the kinds of “Solutions” children can invent and prototype as part of their learning process. The need for a systemic change is growing with the growth of new possibilities in the world.

The collaboration between children and adults is a very vulnerable area which requires very careful handling. The aim is not for children to serve as a tool to allow companies to demonstrate how well they are handling sustainability. Companies benefit from the children’s involvement in many respects. They develop awareness of the employee of the future. They obtain new insights, hear what the customer of the future find important and acquire added meaningfulness for their company. It enriches them in many aspects.

The children experience that their perspective is taken seriously by adults and this gives enormous impetus to children’s involvement. The children look at the company’s dilemmas and immediately question everything. Children naturally have a questioning attitude. They can, as it were, reach the core of creativity by redefining the frameworks. The teachers ensure connection with the curriculum in a professional context. As a result, children have a better understanding of the curriculum. The children apply new insights and concepts which may also be of interest to the companies. For example, the children work with systems thinking tools or the ‘Five Minds for the Future’, tools initially intended for organisations. If we believe it is important for children to learn to ask themselves and others ethical questions, this is something which needs to be taught in a didactically responsible way. Above all, this cannot be deferred until the children are adults.
11 CONCLUSIONS

Witte, aged 8
Conclusions and recommendations
Based on the above, a rethink of our educational system clearly needs to be put forward. Not only do we need to think outside of the box, we also need to redefine the frameworks. If the emphasis is on learning from the past, we can establish that today’s educational system is strongly anchored in the past. Experience over past decades shows that education is slow to change and develop. The system is so complex that it is difficult to change. Difficult but not impossible. If the emphasis is on learning from the unfolding future, there are today new opportunities and perspectives to accelerate development. This will require a joint effort from everyone concerned. Governments play an important regional role in this, but, in line with their own culture, environment or history, everyone concerned can contribute to the process (self-organisation). As part of this, it is important to create a shared framework of reference. Freedom in interconnectedness but not disengagement.

The aim is to see substantial innovation in primary and secondary education by 2020, with effects on all other aspects of the educational system. The following thoughts and suggestions are intended as inspiration and are far from complete.

The diagram below by Daniel Kim (2009) is a useful instrument for visualising at what layers choices can be made and who might play a role in this. The rethink is intended primarily as a means to facilitate co-creation from the lowest layers of the diagram. Although “Core Values” lies beneath the Fundamental Choice, it is important to note that Purpose precedes Core Values in an organizational context. In other words, we first establish Purpose, and then ask the question, “What core values must we live by in order to pursue our purpose most effectively?”

Daniel Kim: “One way of understanding why Purpose precedes Core Values (although the drawing suggests the reverse) is to think of all the choices in the hierarchy as a building you are designing, starting with the foundation of Purpose and adding to it Vision, Strategy, Tactics, and Activities. Then, you are looking to find the suitable “ground” on which to locate your building that will be solid enough to support your building. This is equivalent to seeking the answer to the question of “what values (or ground) must we live by (or build on) in order to pursue our purpose (or support a stable structure) most effectively?”

Who do we want to be as an educational system, what identity fits with the educational system of the 21st century? What is the purpose of the educational system in this age? This question needs an answer based on a personal, organizational, local and national dialogue. Furthermore, those concerned can continue to work further in concrete terms at the various layers of the vision, strategy and tactics through to the activities designed to facilitate sustainable education. A lot is already happening within schools and classrooms. During reflection, you then look at whether your solution pays sufficient service to jointly agreed purpose, and the core values supporting that purpose. We can thus work from the ideological perspective (from bottom to top) and from the concrete activities (from top to bottom).

1. Architecture of leadership

To facilitate rethinking of the educational system, the government needs to take control in the forthcoming period in formulating a proposal to facilitate national dialogue and proposing a direction to enable a rethink of the educational system by 2020. The statements that will come out of the dialogue sessions will provide directional frameworks for the architectural design of the building, the learning process, the curriculum, the leadership and the community. As a cohesive framework the government could provide im-
petus to the design so that in addition to the existing Human Capital Agenda, the move can be made to the Human Capital Agenda, the Social Capital Agenda, the Decisional Capital Agenda interconnected in the Professional Capital Agenda. The Professional Capital Agenda could then monitor the broad lines and main issues from a wider perspective. Furthermore, national, regional and local governments can take their own responsibility for stimulating the set-up of the community and involving businesses and organisations in the community and in the educational system. Innovation in the educational system does not stand alone, it needs to happen in conjunction with all the other variables.

Encourage Communities of Practice in which, for example, good practice is explored and exercised to accelerate learning by professionals. Substantiate this with training as ‘leaders of innovations in the 21st century’ in which your own case is your masterpiece.

**Training teachers for the 21st century**

The Teacher Training Program plays an important role in preparing teachers to learn their profession in practice. It is now more important than ever to prepare teachers to learn to be ‘teachers of the future’. What if in 2020 teachers no longer need to provide instruction, and are instead more process supporters with knowledge of every subject and the ability to connect this knowledge in context? What does this mean for the design of the training program from 2016? More than ever, the educational system in the Netherlands needs to adopt a shared perspective on the future. We need to plan a scenario which, given the unfolding developments, we believe is obvious and then get to concrete work on the scenario. The process can be adjusted en route.

**Personal responsibility**

Using new or innovative insights, frameworks and concepts, every teacher, every school and every school board can itself choose to work with children to enable these children to grow as human beings, as professionals and as inhabitants of this planet. We do not need to wait for the government or an inspectorate before acting on new insights. The government and the education inspectorate are also focused on the optimum development of children within the educational system. We are all dependent on our own internal drivers to make us act.

Nationally, we are seeing a number of wonderful initiatives designed to give greater shape and content to sustainability in classrooms, school and in our regions. Those involved want to share their grappling and the positive results and thus speed up learning for other people and at the same time add depth to their own learning.

In the academic year 2013-2014 ‘prototype for sustainable education in 2020’ project may get underway with a number of organisations and stakeholders participating voluntarily:

- 5-10 school boards:
- 5-10 schools primary education
- 5-10 schools secondary education
- A few Teacher Training centres

Those involved will share what they are already doing and continue to develop their own perspective on sustainable education. In practice, Kim’s diagram is connected with the core values to be developed. The practical experiences of those involved help to develop the government’s proposed direction. This project will be continued in 2014-2015, with experiences shared with a group of follow-up schools. The process comes to a close with a working conference where organisations connect their perspectives with each other and policy frameworks for the forthcoming period are formulated based on the children, the theory and the governments. All the actions are targeted at broad innovation within the educational system with visible effect by 2020.

**Council of Children**

By investing in an integrated vision of children’s genuine capacity to think, the national government is providing a good example and encouraging the establishment of a Council of Children in every Dutch province. Each province ensures that there are sufficient resources to facilitate at least one Council of Children. This Council of Children is at liberty to discuss any topic which it believes to be meaningful for the local or global community. Each Council of Children has a modest budget and shares its experiences via a Council of Children website. Four times a year, each Council provides a representative for the national Council of Children which together explores commonalities in terms of topic areas and how this could be significant in advising governments. Each year, the national and provincial governments explain what they have done with the Council of Children recommendations.
2. The architecture of the building

Many schools have an unhealthy interior climate, they are aged and they are not designed for children and adults to spend long periods in them. There is no other sector with so many semi-permanent buildings and contingency measures. There is a gap between policy-based frameworks for buildings and the content of education. This is the result of a lack of cohesion between the vision for education and the vision for buildings. Regulation fails to make needs in practice. Sufficient fresh air stimulates the brain's functions. The layout and design of the building stimulates connections in the brain. We do not exploit this fact enough. Technology in education has been given greater focus in recent years. Given the expected shortages in the technical professional sector it is important to promote technology not just as a subject and as an activity, but to also use the ‘school building’ to pique interest in and curiosity for technology. Furthermore, it is important to show children concrete examples of sustainability in their learning environment. If the building radiates and demonstrates sustainability, there will be a greater connection in children’s brains which have the effect of encouraging them to see, think about and act with a focus on sustainability. National, regional and local government need a cohesive plan of approach to facilitate sustainable school buildings. Currently, the requirements for a new school building are not aligned with sustainability. This applies to all concerned: develop a consistent and cohesive vision of sustainable education in a sustainable school building.

3. Architecture of the learning process

For example, learn from the Finnish educational system to develop the Dutch eco-social educational system on the basis of new insights. Formulate a new framework of reference based on this. Give schools the scope to independently and jointly give shape to this planning based on this jointly established framework of reference. Provide the scope to learn from practice focused on optimum development of all those involved. Stimulate learning from the framework of reference for the 21st century and collate good practices. This good practice is a source of learning for those concerned personally and for the schools wanting to use it to give shape and content to their own development. Give students the scope to develop a connection with the curriculum. Facilitate students (at all levels) to be able to reflect on the learning process, test students and provide feedback on this process using the framework of reference. Link the framework of testing to the framework of reference. Develop a scientific structure for the years ahead in which the effects of the innovation are collated and patterns and trends discovered which may accelerate learning.

Teacher Training Programs have an important role in giving shape to innovation in the learning process given the short period of time available to prepare teachers for the situation in 2020. This can be done together with schools which have come a long way towards achieving innovation. Students participating in Teachers Training Programs experience the learning as it happens in schools for the future as the children experience it too. This means that teachers at colleges for Teacher Training Programs need to be the frontrunners in this innovation. If a two-year process will help these teachers, it means that this needs to start in the academic year 2014-2015. In the year before this, a start can be made with a group of volunteer teachers representing every college for Teacher Training Programs. Following the initial preparatory year, this group of teachers will be able to give shape to the process at their own college for Teacher Training Programs. The experiences in the first year are basic for the learning process and co-create the design of the second year of the process.

4. Architecture of the curriculum

Digitalisation of instruction

It appears that in the future, all instruction will be delivered in high quality from any digital point in the world. Real-time translation is already possible. It is impossible to keep this ‘under control’. Furthermore, it is important that children learn to select information from digital media. Setting up a digital system requires clear and transparent core value to be jointly created and applied. Furthermore, the digitalisation of instruction has major consequences for the structure of the learning process. Teachers will become more process supporters - they will know the content of the curriculum but primarily they will understand how learning takes place and their role within this. As process supporters, teachers of the future will be more focused of the sustainable shaping of the children as human beings, as professionals and as systems citizens. As part of this process, the transfer will be
made towards mastering the subjects we jointly agree are very important for sustainable development. If the transfer of subject instruction to understanding the learning process is given shape, scope will be created at the same time to give greater content to aspects which will facilitate sustainable behaviour in the future. This must be set up in a methodical and didactically responsible way. A true challenge!

**Develop a curriculum based on key issues and development phases**

The context in the curriculum is an important basis for developing skills as a systems thinker to be able to understand complexity. It is not therefore about dividing the curriculum into small parts, but using interconnectedness to bring the parts into relation with each other and the whole. This could be achieved by bringing the curriculum back to key subjects and phases in the child’s development. These key subjects can be elaborated using a package of choices connected to the different perspectives of multiple intelligence, the head-heart-hands principle and to be connected to new insights with respect to cognitive learning strategies. As a result, you avoid a programme that is imposed on a day-to-day basis which you cannot deviate from, and encourage the making of choices by the children. The materials must enable the student to develop a deep connection with the curriculum.

**Develop a framework of reflection rather than a framework of testing for the inspectorate**

The framework of reflection does include a framework of testing, but the students themselves use this as an assessment tool. The inspectorate provides feedback on the extent of interconnectedness and depth and extent of learning by the professionals in the organisation. The inspectorate develops a database of good practices, which can serve as a framework of reflection for the national quality of innovation. From its helicopter view, the inspectorate can advise the government on the direction and progress of the innovation. The current framework of testing can remain alongside the framework for reflection until there is sufficient evidence that the innovation is having the desired effects.

**5. Architecture of the community**

If self-organisation, diversity and interconnectedness are cores, each region/neighbourhood/community can independently and jointly give shape to developing the community. The local government can encourage initiatives and share the successes and in particular the struggles. Every member of the community can take the initiative to bring everyone concerned together and jointly explore a problem and so co-create the future through interconnectedness. One of the pressing problems in some regions is the ageing population and declining numbers of students forcing schools to close. This is not just a problem for the school or the school board, but for everyone involved.

When a learning process has taken place, use the framework of reference to reflect on the outcomes and examine whether the framework of reference has worked properly in elaborating the process.

Finally, a thought on an article in the newspaper about the culinary innovation in Sweden and consciously focusing attention on local products.

**This week we are eating a cow called Stina,**

The national newspaper called “Volkskrant”, March 9th 2013

…Swedish is ambitious to become one of the world’s top culinary destinations. Minister for Agriculture Eskil Erlandsson was thoroughly laughed at by his foreign colleagues when he announced four years ago that Sweden wanted to elevate itself to the New Culinary Nation. Even his own fellow countrymen were rather taken aback. Sweden makes it’s money from mining, heavy industry and cars. But culinary frame has been more of a thing for the French, Italians and Spanish? What on earth did Sweden have to offer in this area?

Erlandsson earmarked 1 billion Kroner (150 million dollar) for a programme to encourage traditional food production, support gastronomy and put Sweden on the map abroad. Four years later the laughter has been silenced. Swedish chefs are winning international cookery competitions; their restaurants are among the world’s best. Northern cuisine with its back to the nature approach is setting the global standard…

What if we use this approach to give impetus to education? What if our minister were to announce the ambition to be seen as the ‘New Educational Nation’ within 4 years? What if we make a budget available for a programme to stimulate children’s capacity to learn, to support the eco-social educational system and put the Netherlands on the map abroad?
During a parents’ evening, the parents worked on giving concrete shape to the perspectives “take good care of yourself, other people and the environment in order to create the connection between the school and the home situation. Looking at pictures of concepts important to them triggered a discussion in which the parents established how important it is to create interconnectedness between school and home. This raised awareness of each other and personal roles, and increased mutual understanding of the shared responsibility. A parent: “education and development for your child 24/7”.

Of Children

And a woman who held a babe against her bosom said, Speak to us of Children. And he said:

Your children are not your children.
They are the sons and daughters of Life’s longing for itself.
They come through you but not from you,
And though they are with you yet they belong not to you.
You may give them your love but not your thoughts,
For they have their own thoughts.
You may house their bodies but not their souls,
For their souls dwell in the house of tomorrow, which you cannot visit, not even in your dreams.
You may strive to be like them, but seek not to make them like you.
For life goes not backward nor tarries with yesterday.
You are the bow from which your children as living arrows are sent forth.
The archer sees the mark upon the path of the infinite, and He bends you with His might that His arrows may go swift and far.
Let your bending in the archer’s hand be for gladness.
For even as He loves the arrow that flies, so He loves also the bow that is stable.

Kahlil Gibran
Participate in inspirational conversations
Participants in inspirational conversations
It is not bad if people have different colours on their skin. The most important thing is that they have the same colour on their heart. Isabelle, aged 7

Herman Rottinghuis is co-founder of Stratix Consulting Group, a consultancy that focuses on innovative strategy forming in technology environments. He has many years of experience as a strategic thinker and practitioner as a manager with Fokker, Airbus Industry and Transavia Holland, following which he worked as a consultant for, among others, Boer & Croon, Arthur D. Little and Stratix. He is the author of Futuring, the art of anticipation.

Nelly van der Geest leads the ‘Art education in context’ programme within the HKU Centre for Education. Within this programme she focuses on three core topics in research and innovation projects in the field of art education: sustainability, diversity and creative partnerships. Nelly van der Geest studied sociology (UU), theatre (HKU) and change management (SIOO) and also teaches a Masters in Art education. In the field of diversity, she has published work on talent development and five perspectives on the different visions on the inter-cultural she has encountered in art. She believes that creativity is the most sustainable resource of the twenty-first century: In education, this can constantly be instilled in new generations.

Luc Stevens is managing director of NIVOZ (Netherlands Institute for Education and Education Affairs). He has been intensively involved in preparing and shaping government policy for children with learning and behavioural problems. He published nationally and internationally on the quality of teacher-student interaction and adaptive education. He is a popular speaker in this area and many of his findings have now been integrated into existing research. Having worked as a professor, he founded NIVOZ with a few like-minded people because there was no independent voice in the discussion about education in the Netherlands. NIVOZ is a think tank, which, through research, training and forums has a multiform perspective on education in practice and wants to contribute to the social discussion on education.

Sef Vergoossen is a former football coach. He has worked as a trainer with VVV Venlo, MVV Maastricht and Roda JC. He went on to take Racing Genk to national champions and was trainer of the year in Belgium. Having spent a few years working in Japan and the United Arab Emirates, he took PSV to national champions in 2008. He now acts as an adviser to Racing Genk and VVV Venlo.

Willie Smits is an Indonesian forestry expert and animal rights activist and natural conservationist of Dutch descent. Since 1985, he has been working at a scientific research station in Samboja close to Balikpapan in the Indonesian province of East Kalimantan. At the beginning of the 1990s he was team leader on the Tropical Forest Kalimantan Project in Indonesia, an international collaborative association between the Indonesian Ministry of Forestry and the Tropical Forest Foundation. The forester Smits now focuses increasingly on sheltering and the survival of the threatened orang-utan ape. As director of the Gibbon Foundation he also founded the network of animal rescue stations in Indonesia, which has many shelters for protected animals that have been seized. He also designed, built and managed the Schmutzer Primates Centre at Jakarta zoo. He is also one of the initiators of DeforestACTION to counter deforestation and undo the dramatic ecological consequences of deforestation.

Elrie Bakker is chairman of Hoofdbedrijfschap Ambachten (HBA). The HBA is a legally regulated body under public law, which is run by and for craftsmen. The HBA stands for a future-focused view of craftsmen and the craft economy. 36 sectors are currently associated with the HBA.

Henk Oosterling teaches Human and Cultural Philosophy at the Philosophy Faculty at the Erasmus University in Rotterdam. He also founded and is director of Rotterdam Vakmanstad/Skillcity where the political/philosophical concepts he has developed provide direction for the educational programmes and projects, which the foundation rolls out in Rotterdam neighbourhoods. In his most recent publication, he describes the outcomes of the Rotterdam Vakmanstad/Skillcity, EC03. Doendenken (Reflections). Rotterdam Vakmanstad/Skillcity 2010-2012, &#8232; Jap Sam Books, Heijningen 2013
Laurentien van Oranje is dedicated to topics, which have the development of people and their impact on society at their heart. In 2004, she founded the Stichting Lezen & Schrijven with the aim of preventing and reducing low literacy. She is UNESCO’s Special Envoy on Literacy for Development and was Chairman of the EU High level Group on Literacy, which published it report in 2012. She has also spent many years working actively in the field of sustainability and nature conservation. She works with the World Nature Funds, the European Climate Foundation (Fellow) and Fauna & Flora International (President). Her first children’s book ‘Mr Finney and the World Turned Upside-down’ was published in 2009 and has since been translated into several languages. At the beginning of 2011 ‘Mr Finney and the Other Side of the Water’ was published. Mr Finney stimulates children and adults to talk to each as equals about nature and how to treat each other. “With their simple and honest questions, children hold up a mirror to us that reflects how we think and act,” says Laurentien. Based on this thinking she set up the Missing Chapter Foundation (MCF) in 2009. This enterprising foundation promotes dialogue between children and adults with the aim of looking (sustainability) issues and dilemmas differently.

Huib Morelisse graduated in mechanical engineering in 1991 from the Technical University in Delft. He started his career with Booz, Allen & Hamilton where he worked as a consultant for companies in the Netherlands and abroad. In 1997 he left for New York where he completed his MBA diploma at Columbia University in 1999. Through to 2001 he then worked as an M&A adviser for Goldman Sachs in New York and London. In 2002, he relocated from England to Germany where he worked for until 2007 RWE in various roles, including head of strategy. In 2008, Huib returned to the Netherlands as CEO for RWE’s Benelux activities and in 2009 he was appointed to the Management Board of Essent. In 2010, he continued his career as CEO of Nuon. Since 2011, as a member of the Executive Group Management of Vattenfall, he has been responsible for all major projects, Engineering and R&D.

Marc Raaijmakers is director of the Middelbare Horeca school Koning Willem I College (hospitality college) and is inspired by the book ‘The New Dutch Cuisine’ by master chef Albert Kooy. This perspective dictates how education is organised at the college. High School for Hospitality where gastronomy is an experience.

Mission: the success of the student is the reason we exist
Vision: Simply a good school
Core values: We are a Community College. We draw on all talents. We feed creative thinking. We push boundaries. We are working towards a better world.

Anique de Bruin a university lecturer in educational psychology at the University of Maastricht. She is part of the ‘Cognition and Learning’ research group (www.cognition-andlearning.eu). She is co-author of Tool box, 10 oefenstrategieën uit de geheugenpsychologie voor in de klas’ (Toolbox, 10 training strategies from memory psychology for use in the classroom).
Christiaan, aged 4
Mum, compulsory education……does that means it’s compulsory for them to teach me something?” Yoël, aged 6

Education. Education is the basis of our society. As the mainstay and developer of culture, and as the mainstay of our economic development. There is always plenty to do, both in the schools themselves, in politics and in the media. Questions enough: the quality is not good enough, the learning outcomes are too low; there is a lack of social relevance; the air quality in the classrooms is poor, etc. etc. Education generally attracts negative interest. And neither are any structural solutions put forward. Netherlands Enterprise Agency (RVO.nl) (DuurzaamDoor Programma) asked Guus Geisen to conduct a study into education as it is today and looking forward to the desired shape of education in the future. Desired in terms of the interests of the child and in terms of the interests of society, both now and in the future.

Key question: Which system of education will fit well with how children learn and at the same time lead to working on solutions for tomorrow? When answering this question, the focus is on primary and secondary education.

Guus Geisen’s vision looks successively at how the brain works, the importance of developing connections, the role of the framework of reference and the characteristics of education today. Finally, there are conclusions and recommendations regarding the central issue.

How does the child’s brain work with respect to learning processes?

There is considerable difference between an adult’s and a child’s brain. The rational part of the brain does not fully develop until somewhere between the age of 20 and 25. This means that young people are not yet capable of planning and foreseeing the consequences of potential actions. This is not so much because their brain is not yet fully developed but far more because of the fact that young people lack the experience to plan effectively and foresee the consequences of their actions. This means that there is a gap between the more rationally operating adults and the intuitively and emotionally driven brain of children. Throughout evolution, the brain has probably developed in three phases: the instinctive brain (the reptilian brain, brain-stem), the emotional brain (early mammals, limbic system) and the thinking brain (new mammals, neocortex) (Cain 2009, Fogarty 2009). In evolutionary terms, the rational brain is the youngest part of the brain. All three are an integrated part of our brain but they still have important sub-functions. In a life-threatening situation, the reptilian brain is ready for action at all times. The reptilian brain never sleeps! When emotion comes into play, the rational brain is less available. This means that rational learning is more difficult if the student experiences negative emotions when having to meet expectations.

Meaningful learning and the brain

Research into how the brain works at the level of learning has various consequences for education. This means that in education, we need to focus wholly consciously on learning to deal with emotions. Negative emotions decrease the ability to learn. Positive emotions in a subject make the subject meaningful. Meaningful is, for example, the feeling that you really matter or that you understand why you must do something. That what you are learning and doing really can be used and will make a difference. There seems to be a strong inter-relationship between the way in which children learn and the world around them. If learning around social issues is linked to maths and language, there will be good learning outcomes in these areas. This applies equally to learning outside of school (companies, social organisations, governments) and learning around issues which appeal to children. Of crucial importance here is that this does not happen fictitiously in a story which children read in the classroom, but in real life with real people and real companies, in a realistic environment, a living system; with genuine questions to which the children’s solutions matter.

In quantum physics, cosmology and biology, scientists working independently have, through very accurate observations, established three principles of a living system: interdependence, diversity and self-organisation. For education this means that if we want to give children the opportunity to exist in a certain environment (today’s world), we need to give them the safe space in which to develop a relationship with the environment and allow them to create their own world, a world with greater meaning and sustainability. This process is visualised in the diagram below.
In this diagram we can point to the most important tasks of education. It is about enabling the learner to develop a deep connection with an object. It is about the curriculum, a problem, a project or the relationship with yourself, other people or the environment. Developing interdependence with an object brings about a change in the learner. The change means deepening your own and other people’s framework of reference, as a result of which learners create their surrounding world. This illustrates how meaningful learning works. If learning is meaningful, what has been learned will be retained in the long-term memory. The reverse is also true: if learning is not meaningful for a child, what has been learned will not or only partially be retained in the long-term memory. This calls for creating an educational system in which children learn in meaningful situations and learn from their experiences.

Conclusion: If a child is to be optimally stimulated to learn, the environment needs to feel safe, positive emotions must be triggered and what is learned must be meaningful to the child. A school can achieve this by teaching children to deal with the world by truly connecting with the world in a safe context.

Issues for the future

“Children go to school so that in the future, there will be grown-ups who do understand how to treat planet earth properly.” Rembrandt, aged 8

Working with the real world. This can be achieved in a safe setting within education. With real people and real issues. Issues which in the minds and hearts of the children really matter. These include, for example, issues concerning nature, getting older, distribution of wealth, animal welfare and climate change. There are a number of examples of companies sharing their boardroom dilemmas with children and of children coming up with ideas, which in fact will be implemented. Not only does this help the company, it also helps the child and the school. In particular, in these examples the children score higher in their learning outcomes in maths and language. Research and numerous examples of learning processes show that the term sustainable development is helpful to give shape to the issues of the future and add meaningfulness. Sustainable development can be defined as taking good care of yourself, other people and the environment in interdependence with the issues that matter, both now and in the long term.
relevant when we ask whether these findings are now being
applied to education today. Because of this, I will provide a
brief comment on the background to our education and an
answer to the question as to whether meaningful learning is
already integrated within education.

How does education work today?

“We are teaching our children to be successful
in yesterday’s world. I want my children to
be taught to be happy in tomorrow’s world.”

Tex Gunning

The scientific, social, economic and political developments
over the past 300 years have been characterised by the in-
dustrial revolution and machine age thinking with key topics
such as linear thinking, productivity, uniformity and fragmen-
tation. This has led to a global view where we assume that if
you have analysed the parts of a system, this system will be
just as predictable and manageable as a machine. Scientific
insights, social circumstances and technological develop-
ments have led to magnificent solutions to the problems of
our times. Education was designed on the basis of the same
successful principles. It has brought us a long way and is still
a valuable source.

The focus in education, stimulated by the government, is now
firmly directed at achieving optimum development in the ar-
cas of maths, language and reading. There is nothing wrong
with this. But it goes wrong when we believe that we derive
great results in terms of maths, language and reading by
working on maths, language and reading. It has been scien-
tically proven that regular practice during the primary school
period when learning to play a musical instrument or working
with art results in a significantly higher testscore regarding
maths, language and reading.

The future of education

Howard Gardner is renowned for his research and publica-
tions on multiple intelligences. Following years of in-depth
research into understanding the brain, he shifted to the think-
ing that will be needed in the future. He described this in the
‘Five Minds for the Future’.

» The disciplined mind is about expertise in a specific discipline and
looking for greater scope and depth in personal expertise, about
really knowing all the facts. As part of this, we can give maths,
language and reading the emphasis they deserve.

» The synthesising mind is about the ability to see, elucidate and
create a connection both within your own discipline as well as a
connection with other disciplines and this form a whole. Under-
standing complexity not just by dividing it up into small parts, but
also by seeing the whole.

» The creating mind enables you to create something new from
the depth of one or more disciplines and the skill of seeing and
understanding the connection; the ability to think outside the box
and strike out on new paths.

» The respectful mind is focused on respecting other people, see-
ing and celebrating the diversity of the universe, seeing differen-
ces between people and groups as an opportunity to learn from
one another rather than as a threat.

» The ethical mind is about doing what matters and not just what
works; about making the difference and seeing the difference;
about what people do when they achieve ‘good work’ where qua-

ty, a sense of responsibility, engagement and meaningfulness
play a role.

Conclusion: In an educational system based both on optimally
stimulating children’s capacity for learning and working on
meaningful issues, developing the ‘disciplined, synthesising,
creating, respectful and ethical mind’ of every learner needs
to be targeted in a didactically responsible way.

This conclusion and the thinking behind it are not new, and
have been endorsed by many scientists. The issue becomes

Sustainable development:

Take good care of yourself
Take good care of other people
Take good care of our environment

If you set primary and secondary education today against
the Five Minds for the Future, it becomes apparent that there
is a strong focus on the ‘disciplined mind’. Education today
is an effectively developed system for this disciplined mind.
However with its focus on cognition, language and maths,
education today excludes many of the other minds. Either
the other minds do not return or they return as a stand-alone
project, which has no connection with what has been learned
What kind of society do we want to see 15 years from now? How, in the architecture of the process, can we bring together the developments that matter using the principle of interdependence so that we can achieve what we really want? We need innovative thinking and innovative architecture to enable us to move away from the well-trodden paths and develop innovatively. This innovative architecture focuses not just on structural elements but also primarily on cultural elements and the connection between the two.

In accordance with the thinking of the Cradle to Cradle principle, it is important to redesign the architecture of the educational system with a view to optimum development of all concerned. There clearly needs to be investment in an eco-social educational system based on the following architectures:

The architecture of the building.

The building has been designed with a living system as its example. It generates its own energy, breathes in and processes CO2 into oxygen and purifies water. The architecture supports and corroborates the working and learning of everyone involved. The building stimulates the development of connections in the brain. Children see and experience technology because all sorts of technical aspects are visible and not hidden behind walls.

The architecture of the learning process.

Education needs to be motivational for children and for everyone involved. If it is not motivational, you will never have high quality education. The children develop basic skills, insights and attitudes that allow them to develop optimum opportunities during their years at school. The essence of the learning process is focused on developing a deep connection with the curriculum, yourself, other people and the environment from as many different perspectives as possible. Children work independently and together on problems that are meaningful to them and thus discover that they can be meaningful to the world in which they live. They are responsible for their own learning and jointly responsible for the learning of other people and the environment. By applying their own experiences, the children have a better understanding of the more abstract and cognitive parts of the curriculum. Reflecting on the learning process becomes an important tool in more in-

What could be changed?

The results of brain research and issues of the future show that how education is organised needs some rethinking. By breaking down knowledge and information into subjects, we have reached the limits of the system. We cannot split the system down even further into parts and then give each of these parts the attention they deserve. Every approach to a subject area has been developed to perfection in the curriculum and it is cumulatively impossible to execute all the curricula for the various subjects as prescribed within the current classroom time, which are governed by a day/week/month/year. What we need is a new architecture for the educational system.

The architecture of the system largely determines how the process will progress. The existing architecture influences thinking (and vice versa) and actions with respect to this architecture; it keeps us prisoner at where we are. Our brains see what we think and our thinking is shaped by what we already know.
depth learning. Organisations outside of education (the community) present the children with complex questions that they themselves are grappling with. These complex problems are meaningful situations for the children, situations they want to work with. They develop insights and perspectives, which they in turn share with the organisations. They learn that their perspectives on the problem can be meaningful to the ‘world of grown-ups’. In their minds they realise that they are able to understand and influence complex issues. The ‘Five Minds for the Future’ is a basic perspective in the learning process.

The architecture of the leadership.

One of the most important conditions for achieving innovation is high quality leadership. Innovation in the eco-social educational system is possible only if leadership grows at the same time. The leader is the systems thinker in action. He enables leadership to be developed in the organisation and not just in the individual: sustainable leadership (Hargreaves 2006). Leadership is widened within the organisation by allowing those concerned to take on as much leadership as they can personally deliver. This also applies to children. Children are capable of far more than we think. Children are capable of consciously choosing which activities they want to do at what time of the day, working with who ever is most appropriate. This too is developing leadership. The most important task of leaders is to ensure that leadership remains when the leader leaves the organisation. The foundations of high quality leadership are learned from a young age and developed through experience and reflection.

The architecture of the community.

“it takes a village to raise a child” is a well-known African saying

In the last century, the family was the cornerstone of the community. In this century, the community is the centre of the culture and our ‘global village’. The world has quickly become bigger but the framework of reference has not grown at the same pace. Today’s system leaves children working with a 20th century framework of reference and they sense the gap with life in the 21st century. In this perspective, it is not just the parents raising children it is the entire community. It concerns developing citizenship in the sense of ‘systems citizens’. The community as the centre means that we are all important as stakeholders and that the quality of the community depends on the quality of collaboration within this community. If children learn to work well together, we thus form the basis for good collaboration within the community.

The architecture of the curriculum

“Knowledge is a useful aid for being.” Antonio Damasio

Following on logically from the architecture of the learning process, the curriculum also needs to be adapted. The curriculum is no longer the central goal. It is a tool, an aid for teachers to monitor the main line and the development of children. The teacher interconnects the curricula with the problems children are working with. Having fun is not enough, it has to be meaningful and deepen the learning of all participants. Furthermore, the curriculum can expand because children want to learn more. The curriculum will also expand because of the changing world around us. All of the curriculum is denoted by key objectives and is available to every child via digital instruction, remotely if desired. This gives the teachers the opportunity to provide instruction on the learning process rather than on the content of the curriculum. The method is no longer central, but is an important aid, which can be used alongside all other information sources. The curriculum connects to the head, but also to the heart and the hands. Every aspect of the curriculum is connected to the more cognitive approach but also has a completely concrete connection with practical applications. Working with your hands supports the understanding of your head, and vice versa, whereby the emotional connection is the most important lever. It is unbelievably important that the curriculum grabs you, that your heart beats faster and that you have a feeling for the subject. This interdependence ensures depth, because superficiality is not an option.
The role of the teacher

Thanks to the internet, social media and other digital developments, we now live in a ‘glocal world’ (global-local), a world in which far away is close by and what is close by is also far away. Self-organisation, diversity and interdependency are important starting points and can be seen in the structure and culture of the school as an organisation. In this system it is impossible to limit the teacher’s role to transferring knowledge.

It is about enabling teachers to teach children:

» about creating a deep connection with an object or individual;
» about developing a personal and shared identity;
» about developing deep knowledge of your own specialist area but also in context with other disciplines;
» about developing your personal motivation so that you can, want and hold on to learn from yourself, other people and the environment;
» about being meaningful in the connection with social topics close by and far away in both time and place.

In the eco-social educational system of the future, teachers will teach their students to treat the world, other people and themselves with care, so that they themselves can be the change they want to see in the world.

Conclusions

Education today sets the bar too low. Maths and language, and the methodical approach to these have become an aim in themselves, whereas they are in fact a tool. Let’s raise the bar. By giving children the opportunity to work on meaningful subjects using different intelligences and different minds. The child has better retention of what has been learned and is proud of what has been achieved. It sets the basis for more sustainable behaviour in the future. One concrete way of giving shape to this is to allow children to work on their own masterpiece. At the end of primary school each child (independently or in a small group) works on an assignment for an organisation outside of education. During this assignment, all the current subjects provided by the curricula are combined. Writing, reading, maths, geography and history, as well as citizenship. These are no longer an aim in themselves but a tool to provide an effective solution to an organisation’s meaningful problem. At the end of their further education, the students also create a masterpiece with personal and social relevance. This is another realistic step to adulthood.

Not much really needs to change to achieve this: the final achievements are in themselves ideally suited. Many methods are suited for this. Maths and language thus remain an important part of the learning process. In short: it takes some courage from teachers and leaders to do this.

Recommendations

If we are to develop a well thought eco-social educational system in The Netherlands, all concerned should get together in national dialogue to develop a route map towards a new educational system for 2020. Which foundations will most optimally result in the system and behaviour desired for the future? This is a request to the national government to facilitate this dialogue.

To foster and accelerate the dialogue and the road map, a few pilot prototypes of sustainable, meaningful education for 2020 have been carried out. As part of these pilots, the ‘Five Minds’ are given active shape and children are assigned with creating a masterpiece. Schools, school boards and teacher training can take part in these pilots on a voluntary basis. The five architectures form part of these pilots.

The teacher training program plays a key part in applying a new educational system to primary and secondary education. These institutions thus also become actively involved in both the dialogue and the pilots.

In order to provide good substantiation in time, it is important that the pilots are scientifically researched and monitored so that the effects can also be supported. Global developments close by and far away are constantly increasing in pace. This requires focus on the right up-scaling of the pilots, in collaboration with school boards and educational councils.
Nothing is more practical than a good theory,
Martinus Jan Langeveld

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WORD OF THANKS
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The program DuurzaamDoor – Learning for Sustainable Development – aims to help realise a green and sustainable economy by:

» Bringing together all stakeholders and stimulating cooperation between them.
» Strengthening competencies and skills for sustainable development. Focus is on youth, citizens and the business-sector.
» Bridging the gap between action plans and knowledge requirements

Learning for Sustainable Development is a program of four Dutch ministries, the twelve provinces and the Dutch Water Authorities.

More information: www.duurzaamdoor.nl (in Dutch)
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