



The Green Curriculum

Sønderborg Municipality

2016



HOUSE of SCIENCE
VidensBy Sønderborg

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Introduction

The Green Curriculum in Sønderborg takes its starting point the 4 municipal dimensions for sustainability, includes the 17 UN Sustainability Development Goals and connects these to the 42 UNESCO Key-Features for Sønderborg Sustainable Learning City, i.e. education as a driver for sustainability, citizenship and growth.

This means that the Green Curriculum does not only support the global goals for sustainability, but also the existing national curriculum and the municipal 2029 goals for zero carbon emission. It also gives examples of the active student involvement in the local community. And support teachers in their work towards having children and students attain a fundamental knowledge of science, a capacity to act, and an open attitude to participate actively in the development of a sustainable society.

The curriculum sets out to involve the following five related global megatrends:

- BINC (Bio-, Information-, Nano- and Cogno-) technologies and their possibilities and challenges
- The increasing urbanization and the challenges that are connected to the development of cities
- Understanding of demography, diversity and health
- Acknowledgement of climate changes and limited resources
- Changes in world economy and new demands

Progression

From the fundamental understanding of nature to the technological, innovative development. As an introduction the youngest children are taught to take care of and find joy being in nature. In that connection the local nature schools form a basis for children and students experience that nature is decisive for development of a sustainable lifestyle.

The work done in public day-care facilities and kindergartens is connected to the the Green Curriculum for children and young students in primary and lower secondary schools; and this further links to the work of students in subsequent youth education institutions where knowledge and action competence are in focus.

The projects about nature, climate and sustainability offered by nature schools to all levels and all grades will continue without changes so that all these courses are part of the learning of all grades.

The interdisciplinary, local cooperation

In Sønderborg Municipality there are interdisciplinary policies and strategies for health, sustainability and citizenship across all political committees and all areas of administration are committed to these.

Thus there is a direct connection between administrative actions for sustainability, the local education authority's Green Generation Strategy for the promotion of sustainable development education (SDE) and practical realization in the learning of the students through the Green Curriculum, which is thus a linking element between sustainability policies and strategies.

The Green Curriculum specifically highlights interdisciplinary partnerships between primary and lower secondary teachers, pupils and local partners like Sonfor, ProjectZero, Universe Science Park, other House of Science partners, nature schools, companies and other locally rooted learning environments.



Climate, innovation and sustainability are key action targets.

The Green Curriculum, House of Science and VidensBy Sønderborg

With the establishment of the public/private partnership House of Science in 2009 a close cooperation was initiated among local stakeholders and day-care centers, primary and lower secondary schools and youth education institutions. The partnership has continuously been extended with relevant partners.

In 2015 the partnership worked out a 2020 vision for the aim of House of Science and establishes a good connection between the formal basis and the important work with turning the Green Curriculum into action for each single teacher, each single child and student in the municipality of Sønderborg.

In 2016 Sønderborg municipality's strategy to support a reform of the primary and lower secondary school system – VidensBy Sønderborg – became a natural part of the work in House of Science.

House of Science works to ensure the integration of the Green Curriculum

With the House of Science project, we want to create a strong cooperation among the learning environments of the area. Learning from “ABC to PhD” we want to motivate, inspire and create enthusiasm with the newest knowledge about climate, innovation and sustainability based on a unique, practice-oriented and locally rooted approach. We will continuously develop interesting science projects and learning courses for children and students, and we will involve local companies so that together we can draw attention to the general significance of science for our society.

Thus we want to further a curiosity both in the day-care centers, the interdisciplinary understanding in schools, as well as inspire the scientific absorption in the youth education institutions, and at the same time change the way of thinking in the area. The aim is to make it attractive and fascinating for everyone to take part in the House of Science project.

In this way we will do everything possible to make sure that no child leaves our learning and educational system without having experienced firsthand that science subjects are not only interesting but also extremely important for our common future. It is our supreme goal that all our children and students get a basic knowledge and, not least, gain action competence and a desire to participate actively in the development of a sustainable society – **The process takes its starting point in Sønderborg.**



The Green Curriculum put into practice

The curriculum is to be regarded as a dynamic tool that is continuously developed through the involvement of teachers and other persons with an insight into the learning of children and young people.

The plan is structured with a taxonomy, age-appropriate development moving from care and joy → respect → responsibility and action competence. Not in the way that the young people have the responsibility, but so they take an active responsibility for their own actions – this is the intentional impact of the curriculum.

The progression starts with themes like Water, Resources and Energy that are of current interest and have already been linked to national curricula subjects, indications of learning signs, relevant individual contributors, campaigns and learning courses. The progression continues with new areas such as Food that are very relevant from a climate perspective and goes on with e.g. Circular economy, which creates an overall understanding and a platform for further learning in the youth education institutions.

Student's selection of e.g. STEM-educational fields in upper high school may be a measurable effect of the curriculum. STEM: Science, Technologies, Engineering, Math.

Ownership through involvement and measures of outcome

The curriculum is also dynamic in the way there are not material for all levels – yet. Developing material is considered an important way of ensuring implementation of the curriculum. It is acknowledged the importance of teachers' ownership of classroom work - **that this is where the curriculum is transformed into student learning.**

In this way the Green Curriculum seeks to make it easier for everyone with an interest in the learning of children and young people to

- realize the vision of Sønderborg, being carbon neutral in 2029 and future sustainability objectives
- increase the interest for the education in science and civil science
- strengthen the knowledge-based democratic participation in the technological development
- ensure a broad anchorage of the responsibility for creating these changes

and thereby support that Sønderborg now and in the future will be a good place to live, learn and work.

Sønderborg, June 2016

Carsten Lund,
Deputy City Manager,
Children and Education,
Sønderborg Municipality

Peter Rathje
Chairman of Steering committee, House of Science
CEO, ProjectZero

Grøn læseplan via www.houseofscience.dk

Progression	Vand			Ressource			Energi			Mad		
Kl. 0. – 3. Glæde og omsorg	Lærings- mål Tegn på læring	Forløb	Ud af – og ind i skolen	Lærings- Mål Tegn på læring	Forløb	Ud af – og ind i skolen	Lærings- Mål Tegn på læring	Forløb	Ud af – og ind i skolen			
Kl. 4.- 6. Omsorg og respekt	Lærings- mål Tegn på læring	Forløb	Ud af – og ind i skolen	Lærings- mål Tegn på læring	Forløb	Ud af – og ind i skolen	Lærings- mål Tegn på læring	Forløb	Ud af – og ind i skolen			
Kl. 7. – 9. Respekt, ansvar og handlekompetence	Lærings- Mål Tegn på læring	Forløb	Ud af – og ind i skolen	Lærings- mål Tegn på læring	Forløb	Ud af – og ind i skolen	Lærings- mål Tegn på læring	Forløb	Ud af – og ind i skolen			

Energy – and local community learning cooperation

Teachers creating learning lessons – including out of school learning or own lessons:

	<p style="text-align: center;">”Hopscotch”</p> <p>All students have been learning of climate, innovation and sustainability in connection with ”Energy and technology” √ ZERO licence – focus on energy</p>	
Visit to an energy demonstration site, e.g. Solparken Vollerup, or the local power station		FUF-lesson about climate and energy FUF: Future Science Teaching
	The class is measuring school or private homes energy consumption, registration, calculation – and how this can be optimized – the carbon footprint	
		Cooperation with a company about energy consumption
	<p>The class uses the energy trailer for energy learning lessons</p> 	
	The class works with simple programming and robots	
	preschool class (grade 0)	

Energy/technology

The Green Curriculum part 1 – Learning targets of the theme throughout school

Approach	Grade	Learning target
Joy/care	Grades 0-2	You can examine simple things from your everyday life, ask questions and wonder
		You can draw sketches of examined things, so that other people can see how they work
	Grades 3-4	You can design and test simple products – and improve their function
		You know that technologies have their roots in solving problems and covering needs
		You know that electrical circuits exist, and you can assemble simple circuits
		You know that you use energy when you ride your bike, run or sleep
Care/ respect	Grades 5-6	You can examine different energy forms – you can save energy
		You can teach others about renewable and non-renewable energy sources
		You can teach others about the greenhouse effect and of sustainable energy consumption
		You know of energy-saving technologies; you can calculate carbon footprint in everyday life products
Respect/re- sponsibility	Grades 7-9	You can examine production and combine with sustainable utilization of nature
Action competence		You can teach others about the significance of technologies for health and living conditions
		You can explain issues relevant to sustainable energy supply on a local and a global level
		You can act sustainably in connection with transport and energy consumption

The Green Curriculum part 2 – Academic progression of the subject throughout school

Approach	Grade	Awareness of energy/technology	Professional concepts of energy/technology
Joy/care	Grades 0-2	Curiosity and wonder are often essential for inventions	Layout sketch, diagram
		Discoveries often precede inventions	Problem solving
	Grades 3-4	Technological development happens in a process, and product improvement is a part of the process	Product development
		The connection of the energy concept with physical movement	Kinetic and potential energy
Care/ respect	Grades 5-6	The occurrence of energy sources in nature and their CO ₂ contribution	Photosynthesis Respiration
		Sustainable consumption in practice – how?	The greenhouse effect
		Development of technologies and future potentials	Technology history
Respect/res ponsibility	Grades 7-9	The different energy consumption of companies – and CO ₂ emission	Kinetic, potential, chemical, nuclear and radiation energy Transport and storage of energy
Action competence		Examples of social tasks that are solved by intelligent technologies	Welfare technology
		Energy supply in a sustainable and global perspective	The connection between consumption of electricity and production, between the energy consumption and the CO ₂ footprint of the individual person
		The energy change of society and for the individual to zero carbon emission	The connection between the energy consumption and the resulting CO ₂ footprint of the individual person

Resources – and local community learning cooperation

Teachers creating learning lessons – including out of school learning or own lessons:

	<p style="text-align: center;">”Hopscotch”</p> <p>All students have been learning of climate, innovation and sustainability in connection with ”Resources” √ ZERO licence – for resources</p>	
Visit to a waste recycling site		FUF-lesson about resources FUF: Future Science Teaching
	<p>Sonfor give the class a lesson about recycling waste</p> 	
		Green Generation campaign week 40 – Clean Week
	<p>The class visits Sonforce at Nørrekobbøl and have a lesson about demands for metals and the need for recycling</p>	
	<p>The class sort waste in categories</p>	
	<p>preschool class (grade 0)</p>	

Resources/raw materials/waste

The Green Curriculum part 1 – Learning targets of the theme throughout school

Approach	Grade	Learning target
Joy/care	Grades 0-2	You can be in nature without littering and without damaging nature
		You know that it takes a very long time for natural degradation of litter
		You can collect litter and sort it into simple categories
	Grades 3-4	You can sort waste in school into the same categories as at home
		You know that waste consists of raw materials that can be recycle
		You know that you can save raw materials by recycling
Care/ respect	Grades 5-6	You can limit your consumption of raw materials, e.g. plastic
		You know that you consume raw materials from the earth and that they are not eternal
		You teach others how the raw materials are part of an ongoing cycle
		You know how many of everyday products are made from oil
Respect/re- sponsibility	Grades 7-9	You can teach others about examples of the cycle of raw materials
		Action competence
		You know of sustainable, local and global production
		You can calculate carbon footprints from consumption of different raw materials
		You can act sustainable in your consumption of resources, waste and raw materials

The Green Curriculum part 2 – Professional progression of the subject throughout school

Approach	Grade	Awareness of raw materials	Professional concepts of raw materials
Joy/care	Grades 0-2	Everything is made of "something", but can assume other forms – over time	Waste cannot just be left in nature
		Many materials can be recycled	
	Grades 3-4	When much of the same material is collected, it can be recycled	Raw materials
		The raw materials must be processed for us to use them, and it is cheaper to recycle than to dig up new ones	The role of human beings in the consumption of raw materials
		Care/ respect	Grades 5-6
		There are many different metals in the ground, but many of those we use in e.g. electronics are pretty rare – and expensive to make usable	Metals
		When materials are degraded, they are discharged to the environment – also when they are burned	Chains of degradation
		Respect/re- sponsibility	Grades 7-9
Action competence		New technology can make production and consumption more sustainable regarding consumption of raw materials	Technological development
		The CO ₂ contribution can be calculated for all consumption, and you can act so that the CO ₂ contribution goes toward zero	Sustainability in all production and consumption elements

Water – and local community learning cooperation

Teachers creating learning lessons – including out of school learning or own lessons:

	<p>”Hopscotch”</p> <p>All students have been learning of climate, innovation and sustainability in connection with ”Water” √ ZERO licence – for water</p>	
Visit the water supply plant in Gråsten		
	Sonfor visits the class with a lesson about water	
		Green Generation campaign Week 12 – Clean Water
	The class visits FUF and works with water and innovation	
	<p>Pond examinations as with a Nature school ranger</p> 	
	Preschool class (grade 0)	

Water – cycle and discharge

The Green Curriculum part 1 – Learning targets of the subject throughout school

Approach	Grade	Learning target
Joy/care	Grades 0-2	You can tell about animals that live in a pond – names, reproduction etc. You know the three forms of water and you can tell about types of precipitation
Joy/care	Grades 3-4	You know that you have to use water in a sensible way because you care about nature You can talk about which needs animals and plants have to live well in water. You know the term "adaptation" You know that we "ive "on top" of the water we drink and therefore have to take care of our water – you know that there are two kinds of waste water – the one which is filtered, and the one which is led directly into the ocean/the lake. You know where we get the water from and what happens with our waste water. You have seen a model of the water supply plant.
Care/respect	Grades 5-6	You can assess if a pond/a stream is healthy by looking at the animals and plants that live there You know how plants and animals in a pond/a stream are connected in food chains You have seen a model of and know the water cycle, and you know why it can be called a recycling system You know that there are different technological solutions to save water You know that water is a molecule that can dissolve materials
Respect/responsibility	Grades 7-9	You can examine the living conditions of animals and plants in the water environment (e.g. assess the significance of temperature, oxygen content and current)
Action competence		You know that water is an important raw material in e.g. agricultural production and production of food You know examples of conflicting interests when it comes to the use of water and the water environment You can explain how climate changes result in changing precipitation conditions and thereby influence the living conditions for humans and other organisms You can teach others about future drinking water supplies and about the individual person's water consumption and discharge of materials You know examples of sustainable utilization of the natural resources



The Green Curriculum part 2 – Professional progression of the subject throughout school

Approach	Grade	Awareness of water	Professional concepts of water
Joy/care	Grades 0-2	Animals and plants live in water. They have names, breed, breathe, and are adapted to life in water.	The lifestyle of aquatic animals and plants
		The states of materials depend on temperature. Snow, sleet and rain are actually the same.	Solid, liquid and gaseous states
		Water is crucial for all living organisms	Water is a resource
Joy/care	Grades 3-4	Animals and plants have solved their problems with living in water in different ways	The living conditions and features of adaptation of aquatic animals and plants
		The groundwater is created over time, it can be polluted because of percolation, and therefore drinking water is a vulnerable resource.	Groundwater, percolation, pollution of water. Water supply, water plants
		Waste water is coped with through the sewerage system and water treatment plants before it is led into the ocean.	Drainage, sewer, water treatment plant
Care/ respect	Grades 5-6	The water quality can be estimated by means of the animals that live in the biotope	Water quality, water pollution, water analysis
		Animals and plants in biotopes like ponds and streams are mutually dependent	Biotope, food chain, food net Grazing food chain Herbivore, carnivore, detritus
		The different states of water can be seen in models of water cycles. We break into the water cycle when we use water.	Water cycles, evaporation, re-evaporation, condensation
		Water-saving technology exists in people's homes, gardens and workplaces.	Rainwater collection, water efficient showerheads, climate adaptation
		The water molecule is special because it can dissolve many of the chemicals/materials of everyday life.	Atom, molecule, soluble, insoluble
Respect/re- sponsibility	Grades 7-9	The water environment in ponds and streams depends on temperature, contents of dissolved nutrient salts like nitrate, phosphate, oxygen etc.	The water quality depends on abiotic factors like temperature and the content of oxygen and nutrient salts, and it influences the living conditions of animals and plants.
Action competence		Large amounts of water are used in agriculture and are part of many fabricating processes in the food industry. The production can be made more sustainable by using water-saving technology.	Industrial and agriculture process water
		Many companies are reducing their water consumption and thereby their impact on the sewage treatment	Most sewage pipes in the roads are climate separated , i.e. the surface water from the roads is led directly into the ocean, and the waste water from private housings is led to sewage treatment plants.