



## FREQUENTLY ASKED QUESTIONS

### WHAT IS NY SUN WORKS?

NY Sun Works is a non-profit organization that builds innovative science labs in city schools. Through our Greenhouse Project initiative we use hydroponic farming technology to educate students and teachers about the science of sustainability.

We envision a generation of environmental innovators, empowered to create solutions to global resource challenges.

### WHAT IS THE GREENHOUSE PROJECT?

The Greenhouse Project is dedicated to improving K through 12th grade science education in city schools by integrating hydroponic systems into the classroom with inquiry-based curriculum and professional development.

Our classrooms offer students the opportunity to grow food, while learning about science, nutrition, water resource management, efficient land use, climate change, biodiversity, conservation, contamination, pollution, waste management, and sustainable development.

To facilitate this project-based learning environment, the Greenhouse Project Classroom can include hydroponic growing systems, a fish farm, a rainwater catchment system, an energy bike, a weather station, integrated pest management and a composting station.

The hydroponic classroom operates as an integrated part of the school's curriculum and prepares children to exceed NYC and NYS science standards.



# IS IT A GARDENING PROGRAM?

NY Sun Works is a science and sustainability program. What sets us apart from gardening programs is that our labs run throughout the school year and include a STEM curriculum that covers mandated science standards. This means that it is not an additional program, but integrated into the school's science curriculum. With the Greenhouse Project program we not only offer hands-on science and sustainability education, but also address environmental issues related to food production, aquaculture, and urban development, with the added value of having fresh and local produce available year-round.

## WHAT DOES A GREENHOUSE PROJECT LOOK LIKE?

NY Sun Works offers 2 paths, a classroom conversion and a full-scale greenhouse:

- **The classroom conversion** involves installing hydroponic systems and equipment in an existing classroom.  
  
The ideal room would include a sink and good electrical capacity.
- **A full-scale greenhouse** involves building a commercial-grade greenhouse, usually on the rooftop of the school. This is a long-term process that involves the School Construction Authority, architects, engineers, and builders before NY Sun Works installs hydroponic technology and provides programming.



All Greenhouse Project Classrooms may include:

- A variety of hydroponic growing systems
- Compost and Integrated Pest Management stations
- Rainwater Catchment System
- Energy Bike
- Electronic white board and other technology
- NY Sun Works inquiry-based Curriculum
- Curriculum Training and Mentoring
- Technical Maintenance Training
- Community Engagement support
- Maintenance Support by NY Sun Works staff

# WHAT ARE THE STEPS TO BRING THE GREENHOUSE PROJECT TO MY SCHOOL?

1. Establish Greenhouse Project Committee (Principal, Teachers, Parents)
2. Contact NY Sun Works
3. Identify Classroom
4. Identify Sources of Funding and Project Partners (if using city capital funding, process will include the SCA)
5. Project Design (definition of hydroponic systems and services)
6. Construction and Classroom Installation
7. Teacher Training and Curriculum Implementation
8. Classroom Maintenance and Mentoring

## WHAT ARE THE COSTS AND HOW CAN IT BE FUNDED?

There are many factors to consider when estimating the cost of a NY Sun Works Greenhouse Classroom including source of funding, size of project, existing site conditions, site ownership, programmatic goals, as well as maintenance and operations requirements.

- To date, the total cost of projects for a full-scale rooftop greenhouse have ranged from \$850,000 to \$2,400,000.
- Classroom conversions have ranged from \$35,000 to \$250,000 (if including room renovation).

Funding can come from a variety of sources:

- Capital Grants from Local Officials
- Principal's School Budget
- Small Grants
- Parent Fundraising/Crowdfunding



# WHAT DOES A PARTNERSHIP WITH NY SUN WORKS OFFER MY SCHOOL?

## BUILD

### **Project Feasibility:**

NY Sun Works will convene a kick-off project meeting with the school's existing core leadership team, i.e., the Greenhouse Committee, including representatives from the school administration, to discuss ideal equipment placement, programming, applicability of project to school community, budgetary considerations and development of fundraising strategies.

### **Classroom Design and Installation:**

NY Sun Works will design the layout of the systems in the classroom based on electrical capacity and the existing conditions of the space, considering teacher requirements. Project budget will be defined based on the school's choice of systems and program support.

## TEACH

### **Professional Development:**

NY Sun Works provides one-on-one training with a curriculum specialist to help teachers integrate the Greenhouse Project Classroom curriculum into their current school program. Additionally, we offer two citywide trainings per year to bring our partner school teachers together for day-long professional development. Moreover, we offer a certified ASPDP course three times a year to all NYC DOE teachers.

### **K-12<sup>th</sup> Grade STEM Curriculum:**

NY Sun Works provides year-round, innovative, and grade-specific interdisciplinary curriculum. This curriculum is housed in the NY Sun Works Learning Center, an online hub for teachers and educators that hosts the K-12<sup>th</sup> grade "Discovering Sustainability Science" curriculum, training videos, community engagement guides and other resources to teach in the Greenhouse Project Classroom.

### **Maintenance and Mentoring:**

NY Sun Works provides weekly on-site maintenance to make sure the systems are fully functioning, while continuing to mentor the teacher(s) throughout the year. NY Sun Works will also provide troubleshooting training for custodial staff.



# CONNECT

## **Community Engagement:**

NY Sun Works will work with your school to “bring the harvest home,” extending the concepts learned in the Greenhouse Classroom to the larger community. We will support your teacher, sustainability coordinator, and parents to host farm stands, Greenhouse Classroom open house events, harvest celebrations, and cooking demonstrations.

NY Sun Works aligns with the mandated sustainability practices outlined by the DOE Office of Sustainability.

## **Annual Youth Conference:**

Greenhouse Project Partner Schools are encouraged to attend and participate in NY Sun Works’ Annual Discovering Sustainability Science Youth Conference, a live-streaming event showcasing student work from Greenhouse Project Partner Schools. The event features presentations on science and urban agriculture as well as an exciting and diverse line-up of guest adult speakers.

## WHO WILL TEACH THE STUDENTS IN THE GREENHOUSE CLASSROOM?

NY Sun Works requires Partner Schools to designate a teacher(s) who is responsible for the Greenhouse Classroom and related instruction. This is vital for the success of the program.

The designated teacher(s) will receive in-depth systems and curriculum training. The allocation of additional prep time is recommended, as the teacher will need to monitor the systems at least once during the school day. NY Sun Works maintenance support will assist on a weekly or bi-weekly basis and our support staff are always available by phone.



# WHAT IS THE NY SUN WORKS CURRICULUM?

The NY Sun Works curriculum is specifically designed to match both the unit themes of the NYC Scope & Sequence and Amplify. Our program offers small, targeted lessons that directly link to NYC's mandated science units of study while providing meaningful opportunities to both learn about sustainability science and \*grow\* within a hydroponic Greenhouse Classroom.

## Kindergarten - 5th Grade

Our Kindergarten through 5th grade core curriculum introduces students to cutting-edge technology and connects science and the environment through sustainable urban farming. The curriculum has been designed to inspire students to ask questions, investigate systems, make predictions and design solutions.

The Greenhouse Project K-5th grade curriculum is comprised of three sections per grade designed to cover one year of science instruction: the FARMING FOUNDATIONS, the Greenhouse Classroom/GHC CONNECT and the SUSTAINABILITY EXTENSION.

**The Farming Foundations Unit** provides 10 lessons to create a structure for establishing and maintaining your hydroponic farming systems so students can easily grow and harvest lots of pounds of leafy greens throughout the year. Students perform all farming tasks, year round, through short classroom routines developed in this unit as they become confident and independent farmer-scientists.

**The GHC Connect Lessons** are designed to match the unit themes of the mandated NYC Science Scope and Sequence. It offers 15 to 18 targeted lessons per grade, usually in sets of 3, that directly link hands-on learning in the Greenhouse Classroom to the mandated standards. All lessons can be taught independently and at any point in the school year.

**The Sustainability Extension Lessons** expose students to current environmental concerns as it explores sustainable solutions for a 21st century changing planet. It offers 12 lessons per grade, also designed in sets, that include hands-on projects, engineering tasks, and opportunities to build a world-view through citizen action campaigns. The idea is to inspire and empower students to make science+sustainability connections, and to feel that they can effect meaningful and positive change within their own lives, their immediate communities and the world.

## After School

Our after school curriculum was developed under the challenge-based Module design based on the Novare Schools model. Modules are intensive, short-term interdisciplinary courses developed around real world challenges. They are designed to enhance students' understanding of big ideas and broad global concepts, and their development and application of 21st century skills – the kinds of things educators hope students will remember and still need to know and use 20 years from now. In addition, NY Sun Works offers an enrichment opportunity for ELL (English Language Learner) students during afterschool hours.

# THE NY SUN WORKS CURRICULUM, CONTINUED

## 6 - 8th grade

The middle school 6<sup>th</sup>-8<sup>th</sup> grade curriculum has three main sections designed to prioritize a hands-on approach to learning: the M.S. FARMING FOUNDATIONS, the M.S. Greenhouse Classroom/GHC CONNECT and the M.S. SUSTAINABILITY EXTENSION.

**The M.S. Farming Foundations Unit** provides a structure for establishing and maintaining your hydroponic farming systems in the classroom. Students perform all hydroponics farming tasks, year round, through short classroom routines mastered throughout the unit as they become confident and independent farmer-scientists. This practice helps with the upkeep of the systems and plant growth.

**The M.S. Greenhouse Classroom/GHC CONNECT Lessons** are designed to overlap and extend the new NYC-DOE Science Scope and Sequence for grades 6 through 8. Hands-on and project-based opportunities are reflected in every set of lessons. Each grade has 12 to 15 lessons that connect to Life Science and, where plants and hydroponics learning is applicable, to Physical and Earth Science.

**The M.S. Sustainability Extension** offers lesson sets linked to the mandated NYCDOE Science Scope & Sequence units of study. This section of the curriculum expands upon the unique opportunities NY Sun Works' Greenhouse Classrooms and Program offer: a connection between science, technology, and the environmental needs of the 21st century. This section offers 10-12 lessons per grade that extend into projects connected to real world problems and applications. Students discuss global realities, and finding solutions to them becomes the driving force of each project.

## 9 - 12th grade

The high school curriculum offers **Sets of Laboratories** that can be used to fulfill the 20hrs lab time required for the NYC Regents exams. In addition, our curriculum offers a series of **Elective Modules** recommended for 11th and 12th grades.

**The Living Environment in the Greenhouse Classroom Setting:** In this lab series, students identify how energy affects the life cycle of the plant. Students will be asked to explain how energy and matter are interconnected through each phase of plant development: seed & embryo, roots & shoots, leaves & stems, and flower.

**Chemistry Applications in the Greenhouse Classroom:** Students investigate the features of hydroponic farming while practicing Chemistry Regents concepts. Each lab offers a Daily Guiding Question, Objectives, NYS Physical Setting/Chemistry Standards, Scientific Inquiry key ideas and performance indicators, notes for the teacher, and a Lab Student Page.

# WHAT DO WE DO WITH ALL OF THE FOOD?

The by-product of a Greenhouse Project Classroom is fresh produce throughout the school year - and hydroponic systems yield lots and lots of crops! If you choose to include aquaponics you will also be able to harvest fish. There are many creative ways you can use the produce and we can help you choose the best option for your school.

Here are some of the options we recommend:

- use crops for a snack program in the school
- teach science-based nutrition and cooking classes
- run a student-operated farm stand
- donate crops to families
- form meaningful partnerships with local senior centers and food justice organizations
- partner with local restaurants for product exchange

