


STEAM Project

Development of a Climate Controlled Smart Garden System (CCSGS)

Main school subjects involved

Biology & Informatics/Robotics

Complementary school subjects

Chemistry, Physics, Economics

Participant Schools - research, development and testing

A'ksent Academy
(Italy, Switzerland)

Istanbul International School
(Turkey)

Nika School
(Russia)

Swostishree School
(Nepal)

Supporting Organizations

Hardware and STEM knowledge supplier

STEM Education
WRO
(Greece)

Organizational Endowment

International Schools Association
(ISA)

Academic Advising

Federal University of Rondonopolis
(Brazil)

School term:

September 2023 - May 2024

Introduction

Greenhouses are designed to capture sunlight to create a controlled environment suitable for gardening. Normally, people can manually control the quality of the soil, and adjust the heat, light, and the amount of water that plants receive. Nevertheless, the introduction of technologies also allows the automation of this process.

School greenhouses are an excellent way to introduce STEM education and teach students about a wide range of different concepts such as agriculture, ecology, food, sustainability, energy sources, and the influence of climate. Currently, the technology available allows controlling the climate and monitoring the process. Thus, the introduction of technologies creates challenges through which students can access extensive engineering and science knowledge applied to these systems.

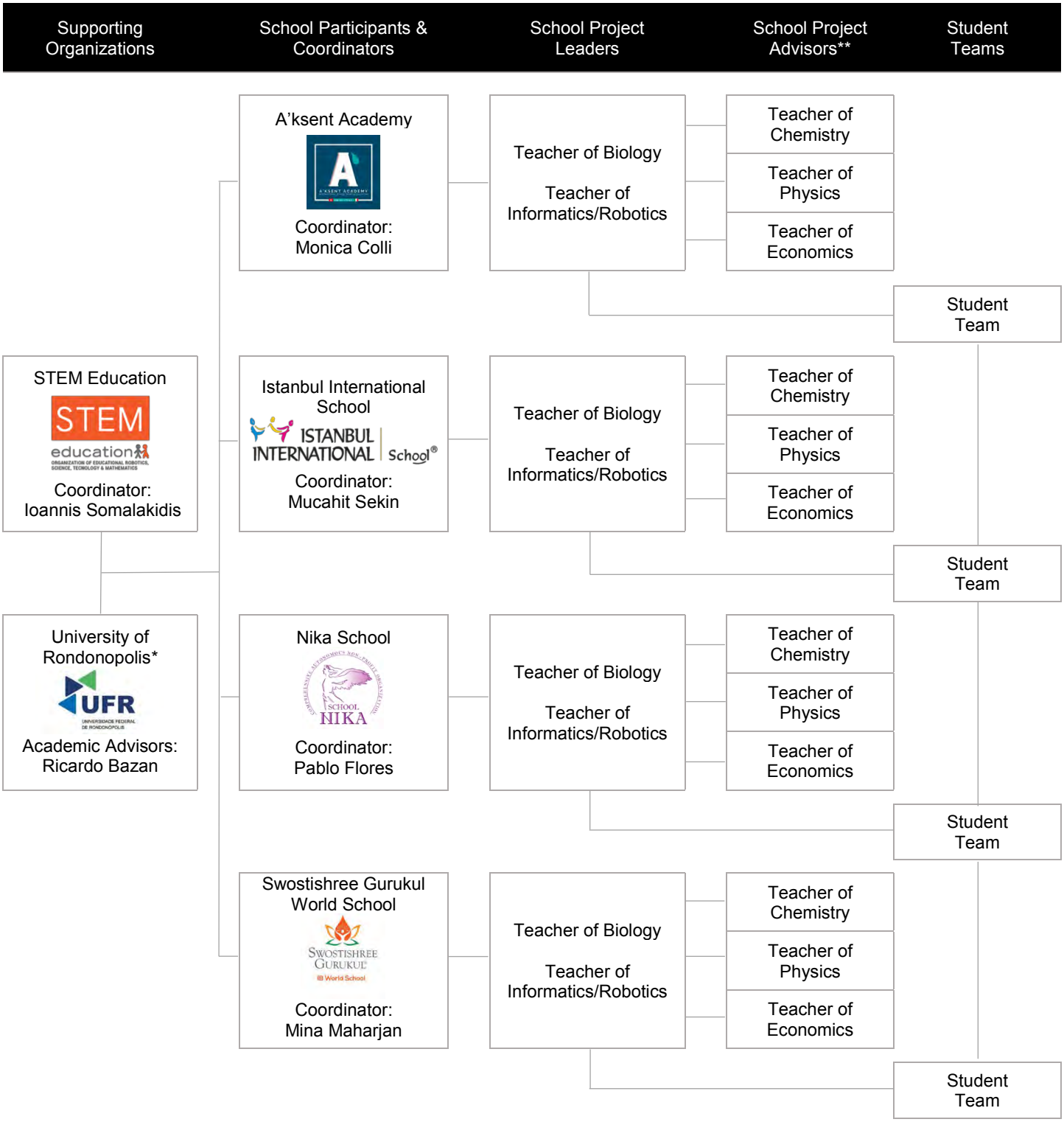
In this project, secondary school students from four different countries will collaborate to design and build a Climate Controlled Smart Garden System (CCSGS) for their respective schools. For this purpose, each school will build its own greenhouse according to their own possibilities and needs. Then, schools will be provided with tomato seeds from The Cascina Don Guanella (Lecco, Italy), and they will receive sets of hardware to build the automatic control system, provided by STEM education (Athens, Greece). Accordingly, all schools will receive exactly the same elements to start the project. During the school year, students of the four different schools will help each other through a collaborative platform where they can share experiences and compare their results.

This project is pupil driven and teachers acting as project leaders coordinate the tasks and supervise it. Pupils will experience independent learning through a variety of activities, project stages, and problems. The project will allow students to gain practical experience in designing and building a system that can help monitor and optimize the growth of plants in a garden. Additionally, these activities can help young learners to develop and strengthen not only their cognitive abilities like their problem-solving skills but also non-cognitive like motivation to learn, caring about the climate and vegetation, improving abilities of multicultural communication, and enhancing team working attitude.

Learning Objectives:

- *Develop an understanding of the principles of gardening and plant growth*. Students will learn about the principles of gardening and plant growth, including the importance of soil quality, watering, and sunlight in the growth of plants.
- *Develop an understanding of Internet of Things (IoT) technology*. Students will learn about the basics of IoT technology, including sensors, data collection, and wireless communication.
- *Develop technical skills in designing and building a smart gardening monitoring system.* Students will gain practical experience in designing and building a smart gardening monitoring system using hardware components such as sensors, microcontrollers, and wireless communication modules.
- *Develop teamwork and communication skills*. Through collaboration and communication with their peers from different parts of the world, students will learn how to work effectively as a team towards a common goal.
- *Foster an appreciation for sustainability and environmental responsibility*. Students will learn about the importance of sustainable gardening practices and how their project can contribute towards reducing their school's carbon footprint.

Organizational Workflow



** Department of Mechanical Engineering / Institute of Agricultural Sciences and Technologies*

*** School Advisors can develop their own subprojects. For instance, the teacher of Economics may develop a subproject regarding the market analysis for the CCSGS or the teacher of Physics may create a subproject to study the sources of heat and energy in and around the greenhouse.*

There are two organizations supporting with knowledge transfer and supplies. The Stem Education organization (Greece) will supply the standard hardware and STEM knowledge to the schools. The University of Rondonopolis (Brazil) will support the activities as academic advisor for all project's participants. Additionally, the International Schools Association (ISA) will be the act as observer, as the four schools are school members.

The project will involve four schools: A'ksent Academy (Italy-Switzerland), Istanbul International School (Turkey), Nika School (Russia) and Swostishree Gurukul (Nepal). Every school will have two school leaders related to the school subjects of Biology (as the main project's theme is associated with agriculture) and Informatics/Robotics (as the project includes a process of greenhouse automation). Additionally, project's leaders have to interact with other teachers of related subjects such as chemistry, physics, and economics.

Project leaders must encourage students of their own schools to interact with students of other schools by exchanging experiences, ideas and data. Thus, students can strengthen their intercultural communication skills. Interactions are also recommended for teachers of the same discipline in order to exchange experiences. For instance, all of them may interact by using a common platform where they can upload and share information:

Biology Collaborative Platform	Teacher of Biology	Teacher of Biology	Teacher of Biology	Teacher of Biology
Informatics Collaborative Platform	Teacher of Informatics	Teacher of Informatics	Teacher of Informatics	Teacher of Informatics
Chemistry Collaborative Platform	Teacher of Chemistry	Teacher of Chemistry	Teacher of Chemistry	Teacher of Chemistry
Physics Collaborative Platform	Teacher of Physics	Teacher of Physics	Teacher of Physics	Teacher of Physics
Economics Collaborative platform	Teacher of Economics	Teacher of Economics	Teacher of Economics	Teacher of Economics

Therefore, it would be needed one platform per subject involved in the project. Teachers would decide which platform is more convenient for their subjects. There are several platforms available, like Padlet, Google Workspace, MS Teams or Slack.