



**Building your own Machine Learning models:** using [Lobe.ai](https://lobe.ai), students apply the technique to predict nutrient deficiencies in their plants and identifying pests in their garden.

**Introducing Microsoft responsible AI framework:** engaging students with some of the social and ethical challenges raised by this new technology.



*(student learning with FarmBeats for Students in the garden)*

## **What is FarmBeats for Students?**

Today's farms are beginning to look a lot more like smart cities. Growers are using modern techniques like sensors, computer vision, and artificial intelligence to acquire a more complete view of their crops. These methods help them make better decisions,

discover inefficiencies, and unlock new insights into improving food production. Seeed is honored and pleased to collaborate with Microsoft in the [FarmBeats for Students program \(FBFS\)](#), which brings these modern tools into the hands of today's learners.

The FarmBeats for Students Program combines an **affordable hardware kit** with **curated curriculums and activities** designed to give students hands-on experience in applying precision agriculture techniques to food production. The learning progression enables students to easily see the **connections between these modern agriculture tools and the opportunities they afford**.

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The FarmBeats for Students Program combines software, an affordable hardware kit - the Grove Smart Agriculture Kit with **FREE** curricula and activities designed to give students hands-on experience in applying precision agriculture techniques to food production.

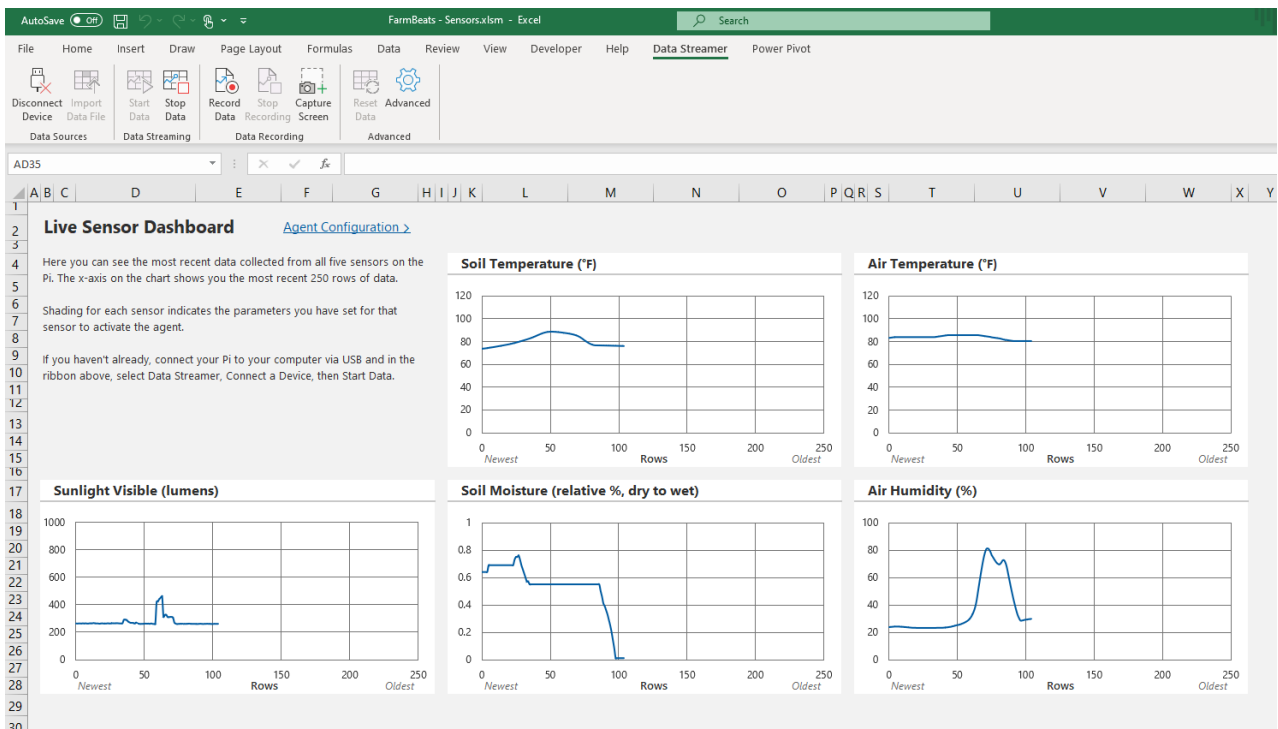
This Grove Smart Agriculture Kit is a hardware kit that consists of an array of multiple sensors measuring soil temperature, soil moisture, sunlight, and air temperature & humidity, etc., the parameters that are crucial for plant growth. With a relay, you can also configure the hardware kit with other hardware modules, to further extend the function from monitoring to controlling such as turn on/off the switch for irrigation or turn on/off the lighting.

With the combination of software, hardware kit, and curricula resources, the students get a hands-on and immersive experience in the process of learning, to learn about sensor technology, how the changes of data collected from different sensors affect the growth of the crops; thus they understand soil condition and crop health, etc., and make better decisions with data-driven insights.

### **Connect to Excel Data Streamer**

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At the same time, this hands-on experience enables students to learn about AI, Machine learning, data science, and the Internet of Things (IoT) by building a garden monitoring system. They assemble a Raspberry Pi equipped with atmospheric and environmental sensors to understand their soil's health, understand the environmental parameters that affect plant growth, analyze the data, and make decisions. The student-built IoT devices connect to custom Excel workbooks that collect real-time data using Excel's Data Streamer. They can see the visualized data and further analyze it, thus they can gain insights and make data-driven decisions for their crops.



## Use Lobe.ai to build Machine Learning Models

With Lobe.ai, students are introduced to building their own Machine Learning models. They build, train, and apply machine learning models to predict nutrient deficiencies in their plants, and identifying pests in their garden. There are activities where students set up an agent and others where they work with a curated big data set. The learning progression enables students to easily see the connections between these modern agriculture tools and the opportunities they afford.

Plus, this FarmBeats for Students program ends by introducing a responsible AI framework, engaging students with some of the social and ethical challenges raised by this new technology.

## California Plants

Label

Train

Play

All Images 80%

Fern 75%

Madrone 85%

Toyon 78%

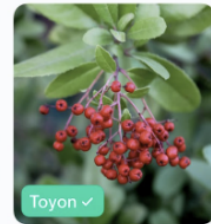
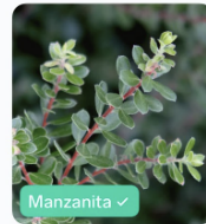
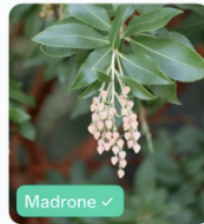
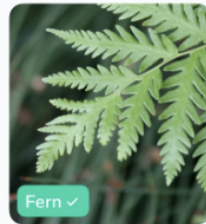
Manzanita 82%

80% of your images are predicted correctly, 20% incorrectly.

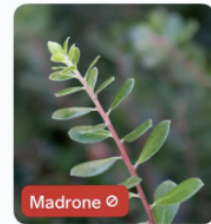
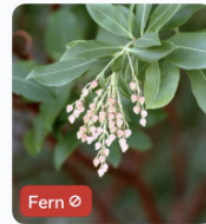
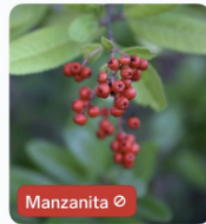
## All Images

View

Correct 80%



Incorrect 20%



## Part List

Product Name	Quantity
Grove Base Hat for Raspberry Pi with a Fan	1
One Wire Temperature Sensor	1
Grove - Capacitive Soil Moisture Sensor	1
Grove - Sunlight Sensor	1
Grove Temperature & Humidity Sensor	1
Grove - Relay	1
Grove - Dual Button	1
micro SD Card with Card Reader - 32GB	1
USB to TTL Serial Cable	1
Screwdriver	1

## Applications

Combined with software and curriculum & resources, you can get hands-on experience, learn about artificial intelligence, machine learning, the Internet of Things, data science and then apply the knowledge in growing plants in the real world.



This kit is highly suitable for use in different scenarios, no matter in the classroom, at home, at maker spaces/ fab labs or through distance learning courses:

- School garden monitoring
- Home garden monitoring
- Distance teaching /learning
- Online courses
- Hobby and DIY projects

### Free Curriculum & Resources

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With the partnership between Microsoft and the National FFA organization, FREE curated curriculum and activities are designed to give students hands-on experience building a plant management system for use in classrooms, gardens, and greenhouses.

Please visit [\*\*Microsoft FarmBeats for Student program page\*\*](#) for the curriculum and abundant resources of teachers' guide book and students' activities as well as PowerPoint slides and outline for lectures related to the AI4K12 Five Big Ideas for artificial intelligence.

