



# Get Cutting Edge Equipment with AdoptAClassroom.org Funding



by

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# STEM ACTIVITY

## GET CUTTING EDGE EQUIPMENT WITH ADOPTAClassroom.ORG FUNDING

### INTRODUCTION

Greetings fellow educators! Want to give your biology, environmental science or other STEM students an authentic classroom-based research experience that might even lead to a scientific publication? I'm Dr. Kudish and here's how I do it!

I'm using AdoptAClassroom.org donations for a range of purchases from lab stools to bleeding-edge biotechnologies that empower students to design and perform innovative authentic scientific research. AdoptAClassroom.org is the ideal platform for teachers because of their national visibility and generous programs like Classroom Donation Match (they'll double your donations!) and Spotlight Fund grants. Read on to see how AdoptAClassroom.org can empower your student-scientists too!

My students collect soil samples outside and return to our classroom-lab to extract, sequence and analyze microbial DNA. What kinds of opportunities does this create for student inquiry? The sky's the limit! Okay, technically, the soil's the limit :^). This "metagenomic" sequence analysis is a wonderful way for students to design and engage in a myriad of creative science projects, like this one (read on, fellow teachers!)

### EXEMPLAR

Evidence-Based Probiotic Management of a Campus Pollinator/Rain Garden  
Middle and high school students in my classes and summer biotechnology camps are planting a pollinator/rain garden on campus! They're excited to use metagenomic DNA sequence analysis alongside traditional pH, NPK and moisture to inform their garden management choices. For example, students are looking up resources and having discussions about introducing probiotic soil organisms such as mycorrhizal fungi (e.g. wine-cap mushrooms) and nitrogen-fixing, nitrifying or denitrifying bacteria (free-living or rhizome-associated bacteria).

They're even thinking ahead about how to defend the garden against potential plant pathogens! For example, students learned that Xcc are lytic bacteriophages that may be used for bioremediation of *X. campestris*, which causes Bacterial Leaf Spot, a common disease of pepper plants in Eastern Maryland, where our school is located.

Two main biotechnologies empower students to assess microbial biodiversity in our garden. Here are links and approximate costs and times to get you started:

- DNeasy PowerSoil Pro Kit (Qiagen). For more information, [click here](#).
- MinION Nanopore DNA Sequencer (Oxford Nanopore Technologies). For more information, [click here](#).

#### DNeasy PowerSoil Pro Kit

Approximate time needed: Middle school and high school students in my summer biotechnology camps usually complete this protocol in about an hour. Students in my 50-minute courses complete the procedure over two class periods (we stop between steps 7 and 8). This allows plenty of time for questions and explanations in each period.

#### Approximate cost

\$400 for 1 kit to process 50 soil samples (more than you'll need for an academic year)

#### Hardware needed

A vortexer and a microcentrifuge

#### MinION Nanopore DNA Sequencer

#### Approximate time needed

5-10 minutes for sample prep, then samples run overnight

#### Approximate cost

\$1,000 for the MinION Starter Pack (everything you'll need for an academic year) Hardware needed

DNA Sequencer (comes with the MinION Starter Pack) and a laptop (iOS or Windows)

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