

Urban Advantage

Formal-Informal Collaborations to
Improve Science Learning and
Teaching

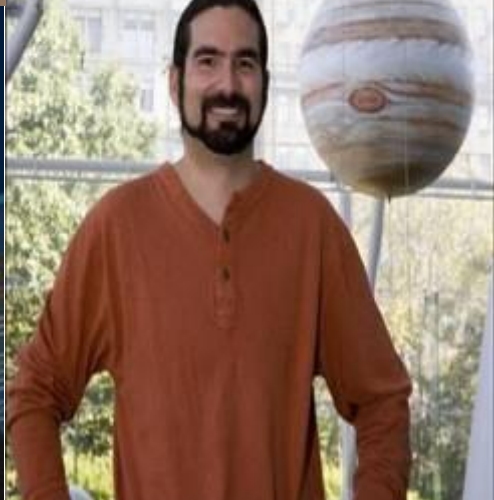












How do you work with partners outside the school system?

- Who are your partners?
- How long have you worked with them?
- What do they provide?
- How are they funded to work with you?



How do partnerships help improve

TEACHERS' PRACTICE STUDENTS' LEARNING



The goal of the **Urban Advantage** program is:

To improve students' understanding of scientific knowledge and inquiry through collaborations between public school systems and informal science education institutions.

metro Denver urban advantage

middle school science initiative

Students, teachers, and families do, think, and explore like scientists
—both in and out of the classroom



urban advantage

middle school science initiative

Partner Institutions



New York
City Council



urbanadvantagenyc.org

metro Denver



urban advantage

middle school science initiative

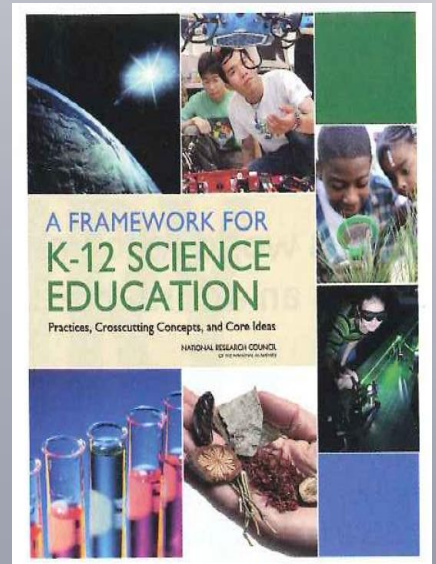


Urban Advantage is about
students **doing science**

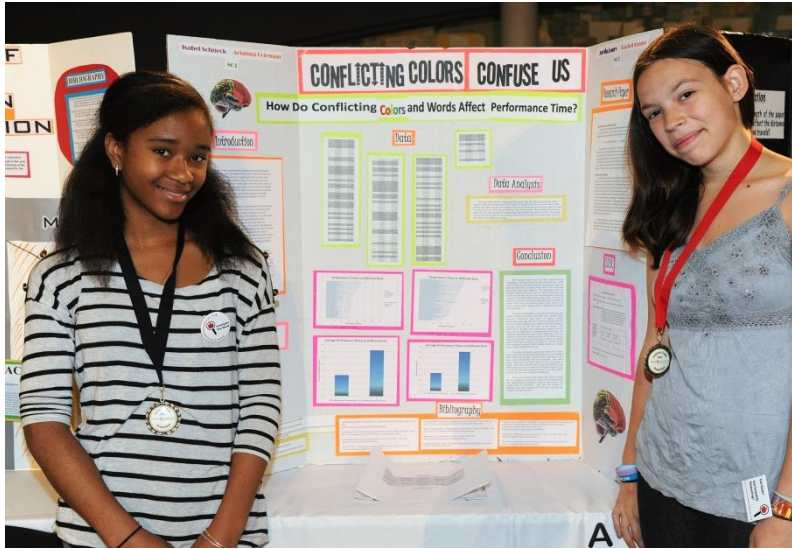


Scientific and Engineering Practices from the *new* **Framework for K-12 Science Education**

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics, information and computer technology, and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information



Urban Advantage - NYC Science Investigations



Scientific Investigation Display Board

Question	Project Title	Discussion
Hypothesis and Background Information	Names of Students School name	Scientific explanation or argument
Investigation Design	Materials and Procedure	Conclusion
	Results Data Tables Graphs	Literature Cited

Controlled Experiments

Secondary Research Projects

Field Studies

Design Projects



Question: What is the effect of a rotten apple on the condition of the apples around it?

The Effect of a Rotten Apple on the Condition of Apples Around It

Question

What is the effect of a rotten apple on the condition of the other apples or fruits around it?

IDD Chart

Title: The Effect of a Rotten Apple on the Condition of Apples Around It

Question: What is the effect of a rotten apple on the condition of apples around it?

Hypothesis: If one "bad apple" is put into a bowl of fresh apples, then the fresh apples will spoil because the ethylene gas from one rotten apple would spread the other apples to produce ethylene gas, causing them to rot.

Independent Variable: The rotten apple

Change in Independent Variable: One rotten apple and two fresh apples

Number of repeated trials: 3

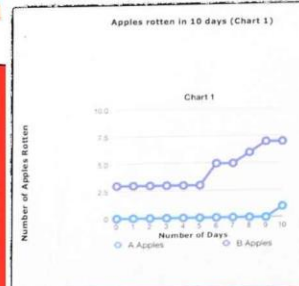
Controlled Variables: containers A-1, 2, and 3; containers A-1, 2, and 3

Dependent Variable: Condition of Fresh Apples

Observations and Data

Table 1: Observations of Rotten Apples

Day	Observations in A-1,3	A-1 rotten	Observations in B-1,3	B-1 rotten
1	The apples are firm, starting to ripen, and are in a healthy condition.	0	The healthy apples are firm and in good condition. The rotten apple was mushy and its flesh was discolored and sagging. Unhealthy.	3
2	The apples (all three) still look healthy. They are red with splashes of green, just like how we bought them.	0	The healthy apples are in the same condition that they were in yesterday. They rotten apples are now leaving juice from the splashes that are muddling.	3
3	The apples (all three) are still healthy. They look the same as they have been for the past days.	0	The healthy apples are in the good condition. The rotten apples and leaving juice at the bottom and are so soft that the other fresh apples (touching it) are starting to shape the apple.	3
4	The apples (all three) still look healthy. The still look firm and in edible condition.	0	For the first time, we noticed that especially in container B-1 that the fresh apples are starting to brown. The rotten apple in B-3 is not rotten however, that it is completely rotten. B-2 is still all rotting.	3
5	No visible changes since yesterday.	0	No visible changes since yesterday.	5
6	The apples still look healthy.	0	The apples in container B-2 have brown spots and are starting to rot. The apples in the other containers are starting to look mushy as well.	5
7	No visible changes since yesterday.	0	No visible changes since yesterday.	6
8	The places where the apples are in contact with other apples are starting to brown.	0	The apples have a green and white mold speckling them. The pre-rotten apple in B-3 is completely rotten.	6
9	Apples in A-2 are browned and have started the process of rotting. A-3 and A-1's apples have brown spots, but are not really very rotten at all.	0	The apples are moldy, mushy, juicy, brown, and rotten in all containers except B-2. Apples are rotten, but not nearly as rotten as in the other containers. Perhaps the pre-rotten apple in that container was less rotten than the others.	7
10	Apples are bruised and ripe, but still not yet rotting. One apple, however is bruised enough to be considered rotten.	1	The apples are mushy, moldy, brown, and juicy in all containers. B-2 is not the mushiest or brownest, but still, the apples are rotten.	7



Data Analysis

Tables 1-2 and Graph 1 show the effect of one rotten apple on apples around it. The data supported the hypothesis. More apples in the B containers, (the ones with rotten and fresh apples), rotted than A apples. The B apples did start higher, but the number of rotten apples increased faster so that means the rotten apples did make the B apples rot faster. That makes sense because the ethylene that would have been produced by the rotting apples would have caused the fresh apples in the same container to rot. With no rotten apples in the A containers, it took about two weeks to start rotting, which is about the normal time without factors in the environment.

Conclusion

The purpose of this experiment was to investigate the effects of bad apples on the condition of the apples around it. The major findings were that the B containers (a rotten apple with two fresh ones) rotted more than the A containers (three fresh apples). The data did support the hypothesis, which was that the B containers would rot more than the A containers.

Other researchers of this investigation found, also, that the B containers rotted more than the A containers. This was because of the ethylene. The bruises on the bad apples left off more ethylene which was absorbed by the other two apples, making them rot, in the same container.

This investigation/experiment could be improved by doing different things with the apples. Perhaps cutting them up into sixths. Or putting more apples in the containers, and seeing if they all rotted the same amount. One other thing that could have been done differently was a constant-light source, which would put the same amount of light on each container. Another source of error might have been a constant temperature. Other than that the experiment/investigation went very well.

Bibliography

- "Apples on Spigs." *Biological Sciences*. *School of Biological Sciences*. N.p., n.d. Web. 13 May 2010. <http://www.biology.ed.ac.uk/research/groups/development/microbes/apples.html>.
- "How One Bad Apple Spoils the Bunch?" *Botanical Society of America*. *Teaching extension and education since 1893*. N.p., n.d. Web. 13 May 2010. <http://www.botany.org/botanytextbook/badapple.html>.
- "Ethylene." *Plant Hormones*. N.p., n.d. Web. 13 May 2010. <http://www.plant-hormones.com/ethylene.html>.
- "Ethylene - Wikipedia, the free encyclopedia." *Wikipedia, the free encyclopedia*. N.p., n.d. Web. 13 May 2010. <http://en.wikipedia.org/wiki/Ethylene>.
- "Wikipedia.com - How long does it take for an apple to rot?" *Wikipedia.com*. The CIA's Wiki. N.p., n.d. Web. 13 May 2010. http://wiki.answers.com/Q/How_long_does_it_take_for_an_apple_to_rot.

Hypothesis

If a rotten apple was put where the apple is bruised in contact with the healthy apples in a sealed container, then the healthy apples will most likely begin to spoil. This will happen because the ethylene gases that the spoiled apple gives off will affect the healthy apple and will spread. Since the affected area is touching the healthy apples then it will have a greater chance of getting sick since they are in contact.

Research

It was found from background research that ethylene hormone released from fruits such as apples and bananas promotes ripening of fruits. When ethylene is released to the tissues of the fruits around it causing them to ripen synthetically too, making it one of the most commonly (and natural) compounds in the world. Ethylene makes process and many farmers can make their fruits ripen to get more money faster.¹

Ethylene isn't the only cause of apples rotting the same apples to decay. These two fungi look similar to an apple, but are actually very different. One makes the apples watery and mushy while the other makes the apple hard and develop white spots. These spots are the fungus's spores.

It was also found that a typical apple that is left for four hours. A refrigerated apple (with no flesh exposed) about a week to begin rotting. However, it may take long weeks for the apple to fully rot in both scenarios. It is learned that softer apples, such as Fuji and Cortland tend to rot faster. This is thought to be because their softer flesh allows ethylene able to penetrate faster. Also, softer apples are usually sweeter. Sweetness means the starch has been broken down into sugar and that the apple is further along in the ripening process.²

- 1. <http://www.botany.org/botanytextbook/badapple.html>
- 2. <http://www.biology.ed.ac.uk/research/groups/development/microbes/apples.html>
- 3. http://wiki.answers.com/Q/How_long_does_it_take_for_an_apple_to_rot

Procedure

Place three fresh Macoun apples in a plastic container and seal the lid. Repeat this process until you have 3 containers with 3 fresh apples in them. Place 2 fresh Macoun apples and one rotten Macoun apple in a plastic container identical to the ones used previously and seal the lid. Repeat this process until you have 3 containers that have 1 rotten apple and 2 fresh apples inside. Place all the containers under the source of constant light (any amount of watts). Record observations every week/day for two weeks (10 days) of observations over 14 days.

Materials

- 6 container store brand plastic containers with lids
- 15 fresh Macoun apples
- 3 rotten Macoun apples
- A constant source of light.



Number of Apples Rotten (Table 2)

	A Containers	B Containers
Day 1	0	3
Day 2	0	3
Day 3	0	3
Day 4	0	3
Day 5	0	5
Day 6	0	5
Day 7	0	5
Day 8	0	6
Day 9	0	6
Day 10	1	7



UA Framework: Six Components

Professional Development

- Workshops for science teachers and school administrators

Classroom Materials and Equipment

- Science materials/equipment for schools, teachers, & students

Access to Institutions

- Vouchers for class field trips, family field trips and visits

Outreach to Families

- Public exhibitions of student work, family science events at institutions, support for school-based family science nights

Capacity-Building and Sustainability

- Lead Teachers, Leadership Institute, Demonstration Schools

Assessment

- Program goals, student learning, and systems of delivery

COMPONENT 1

Professional Development for Teachers and Administrators



Teachers

- Immersion in inquiry workshops for new teachers
- Continuing teacher workshops



Administrators

- Science Leadership Breakfasts

COMPONENT 2

Classroom Materials and Equipment

- Lighted plant growing environment
- Digital cameras
- Dissecting microscope
- Stopwatches
- Magnifying glasses
- Rock collections
- Field guides
- Thermometers
- Psychrometers
- Aquarium kit
- Designing rockets kit
- Water and soil field-test kits



COMPONENT 3

Access to UA Partner Institutions

- Class field trip vouchers
- Family field trip vouchers
- Student and Family vouchers
- Teacher vouchers



COMPONENT 4

Outreach to Families



- Family Science Sundays at Partner Institutions
- Parent Coordinator Workshops
- Family Science Nights at Schools
- Annual UA Science EXPO



COMPONENT 5

Capacity-Building and Sustainability

- UA Lead Science Teachers
- Leadership Institute
- Demonstration Schools



COMPONENT 6

Program Assessment and Student Learning



- Program assessment
 - Longitudinal program evaluation
 - Classroom observations
 - Teacher surveys and interviews
 - School visits
- Student learning
 - Science exit projects
 - New York State 8th grade Intermediate-Level Science Test

Outcomes of our work as partners

- Teacher professional development
- Instructional resources
- Redefining field trips
- Impact on teachers and students



Immersive Professional development

Workshops, field work, teams, place-based



Science Leadership Teams

Teams of teachers, administrators, parent coordinators, and UA partners



IDD

Investigation Design Diagram

Title:

Sample format: The effect of (independent variable) on (dependent variable)

Research Question:

Sample format: How will (independent variable) affect (dependent variable)?

Hypothesis:

Sample format: I think (independent variable) will affect (dependent variable) because (explain why you expect/predict this relationship between the variables)

Independent Variable: (or the "you change it" or "you choose it" variable)

Change in independent variable:					
Number of repeated trials:					

Dependent Variable: (or the "you measure it" variable)

Constant variables:

Instructional Resources

Making science accessible

Leveraging resources of institutions

Linking science & literacy

RIVER ECOLOGY

Investigating the effect of zebra mussels on the Hudson River

New York State's Hudson River has seen many changes, but perhaps none more dramatic than the arrival of the zebra mussel in 1991, and its rapid spread. Understanding environmental changes like this one means looking at the whole ecosystem: the web of interactions among organisms and their physical environment. Biologists at the Cary Institute of Ecosystem Studies have been studying the Hudson's freshwater tidal ecosystem since 1987. They look for patterns and connections in order to understand how the river is changing, and might change in the future.

This website gives you access to the actual data these scientists have collected about the river: factors like the cloudiness of the water, its temperature, and how many and what types of organisms live in it. Use the graphing tool to look for patterns that connect the dynamic parts of this ecosystem. Can you help the scientists investigate the effects of the zebra mussel invasion?

This project is a collaboration between the American Museum of Natural History and The Cary Institute of Ecosystem Studies.



Funding for this web site provided by the National Science Foundation



Explore the River

Learn about the history of the Hudson River and how scientists monitor the river's tidal freshwater ecosystem.

[Learn more...](#)



Meet the Scientists

Using video and text passages, you can learn about the work of scientists at the Cary Institute who are studying the invasion of zebra mussels in the

[Get Started...](#)



Graph the Data

Pick which factors you want to study and use this interactive tool to view them in relation to one another.

[Get started...](#)



Analyze the Data

Can you tell which factors are related? Observe any patterns? Figure out how different parts of the Hudson River ecosystem are connected?

[Get started...](#)

River Ecology Teaching Case


amnh.org/education/hudsonriver

RIVER ECOLOGY

Investigating the effect of zebra mussels on the Hudson River

- Home
- Explore the River
- Meet the Scientists**
- Graph the Data
- Analyze the Data

Meet the Scientists



These video segments and text passages with discussion questions (listed below) provide a case study of the Cary Institute scientists at work on the river and in their labs. You can watch the video segments and read the passages to help answer the discussion questions. There is also a 7-minute video documentary feature of the Cary Institute scientists' work.

Part 1: The Problem	(2:02)	[download]
Passage One: An Unwelcome Newcomer (Teacher Student)		
Part 2: Observation	(3:29)	[download]
Passage Two: Zebra Mussels and the Hudson River (Teacher Student)		
Part 3: Results	(4:16)	[download]
Passage Three: The Short-Term Impact of the Zebra Mussel Invasion (Teacher Student)		
Part 4: Going Further	(2:55)	[download]
Passage Four: Long-Term Monitoring of the Hudson River (Teacher Student)		
Documentary Feature	(7:39)	[download]

RIVER ECOLOGY

Investigating the effect of zebra mussels on the Hudson River

TEACHER
VERSION

RIVER ECOLOGY

Investigating the effect of zebra mussels on the Hudson River

STUDENT
VERSION

PASSAGE ONE

An Unwelcome Newcomer

Invasion of the Zebra Mussels

The zebra mussel is a small aquatic animal with two shells like a clam, named for its striped shell. This tiny creature may look harmless, but it can cause big problems. The zebra mussel is an invasive species, a species that's brought from its native area to a new place where it thrives and causes changes in the local habitats and communities.

Zebra mussels once lived only in freshwater lakes and rivers of Europe and Asia. But in the 1980s, they appeared in the Great



ZOOM IN

Zebra mussels pump water through their gills to filter out particles of food (primarily

RIVER ECOLOGY

Investigating the effect of zebra mussels on the Hudson River

- Home
- Explore the River
- Meet the Scientists
- Graph the Data

- Overview

- Over Time

- Along the River

- Analyze the Data



Graph the Data:

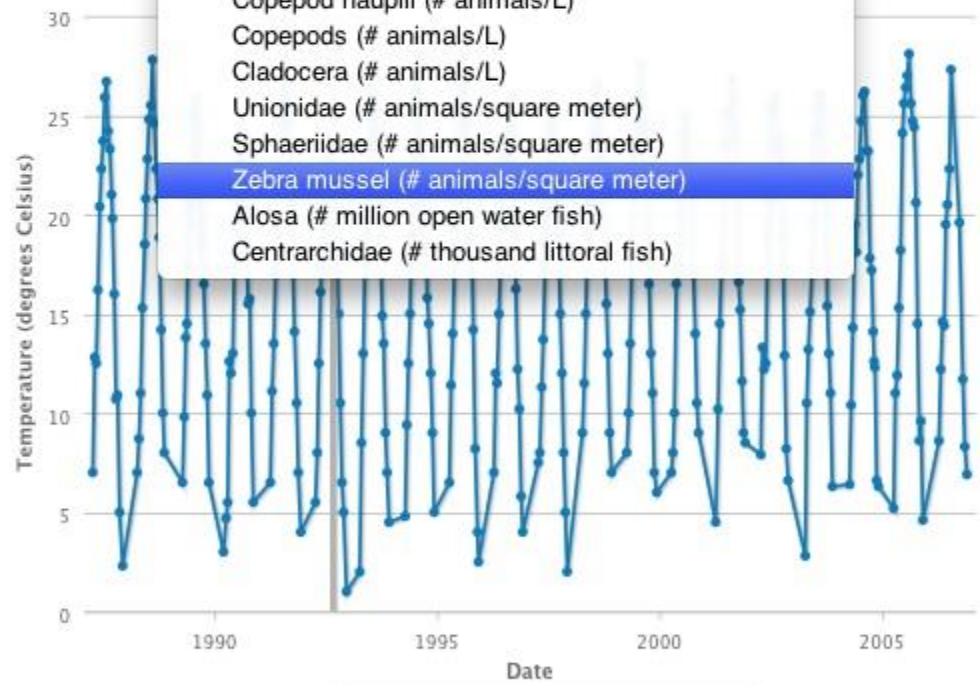
Over Time

1. Select a sampling station from the map below.
2. Click "Chart this location" to view data for that location.





- Abiotic
- Temperature (degrees Celsius) ✓
 - Dissolved oxygen (mg/L)
 - Oxygen saturation (%)
 - Secchi depth (cm)
 - Total suspended solids (mg/L dry weight)
- Biotic
- Chlorophyll a (micrograms/L)
 - Bacterial abundance (# billion cells/L)
 - Bacterial production (micrograms carbon / L / day)
 - Rotifers (# animals/L)
 - Copepod nauplii (# animals/L)
 - Copepods (# animals/L)
 - Cladocera (# animals/L)
 - Unionidae (# animals/square meter)
 - Sphaeriidae (# animals/square meter)
 - Zebra mussel (# animals/square meter)
 - Alosa (# million open water fish)
 - Centrarchidae (# thousand littoral fish)



- Temperature (degrees Celsius)
- Zebra mussels established (1992)

Show/Hide the date marker using the checkbox
Drag within chart to zoom



First parameter: Zebra mussel (# animals/square meter)

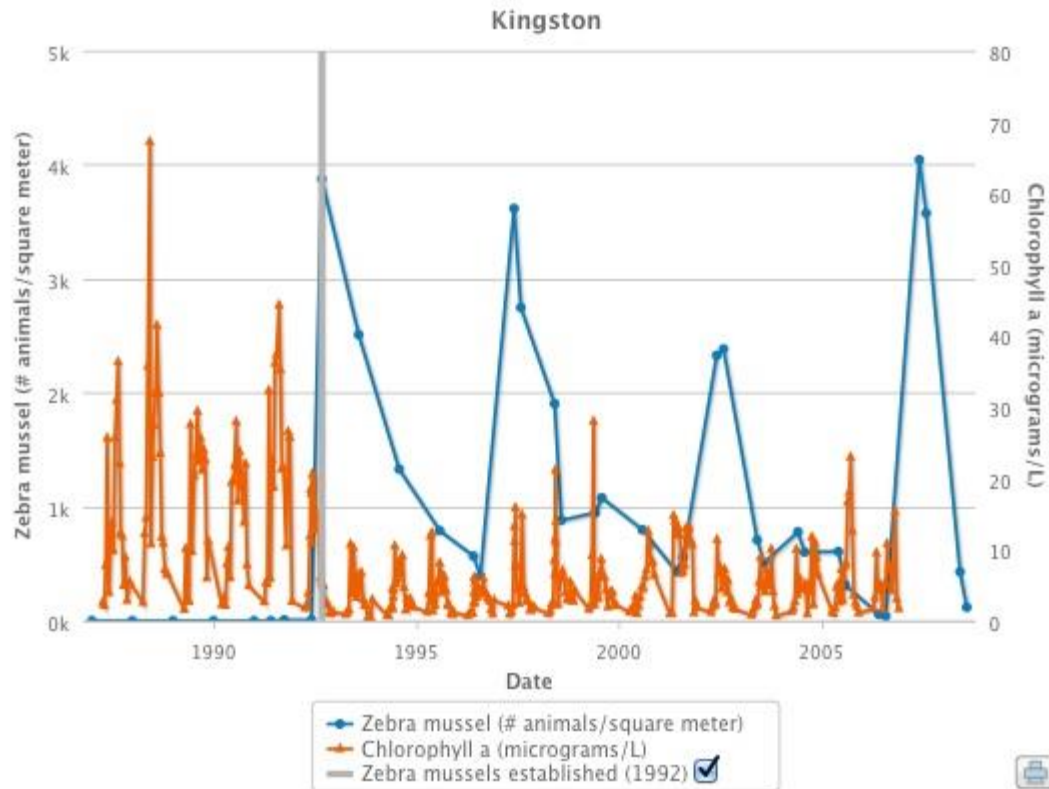
Second parameter: Chlorophyll a (micrograms/L)

(Optional) Choose a "Split Date" to average the data:

No split date (Show line graph, no averaging)

Split Date #1

Split Date #2 (optional)



Show/Hide the date marker using the checkbox
Drag within chart to zoom

First parameter: Zebra mussel (# animals/square meter)

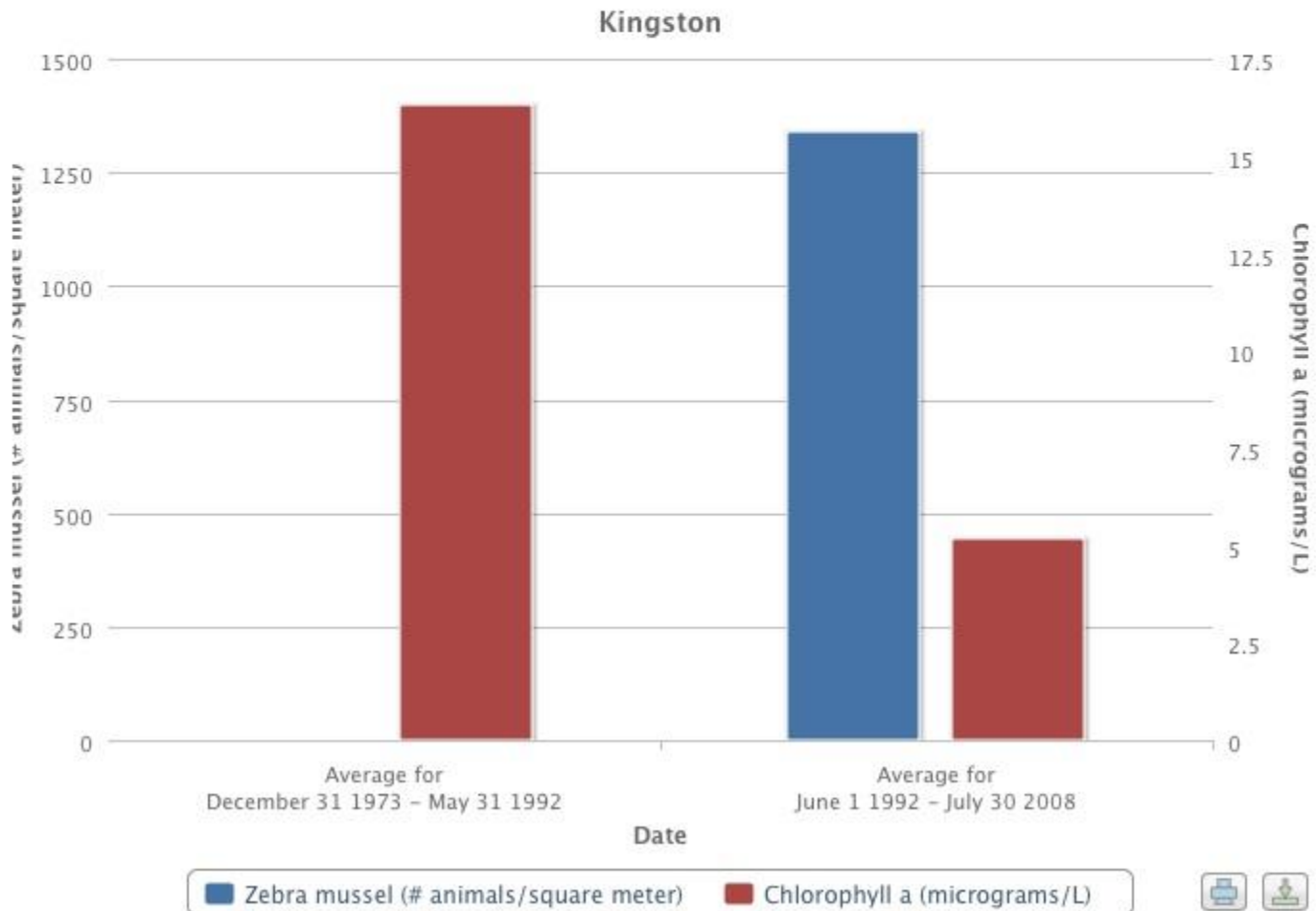
Second parameter: Chlorophyll a (micrograms/L)

(Optional) Choose a "Split Date" to average the data:

No split date (Show line graph, no averaging)

Split Date #1 1992.06.01

Split Date #2 (optional)



First parameter: Zebra mussel (# animals/square meter)

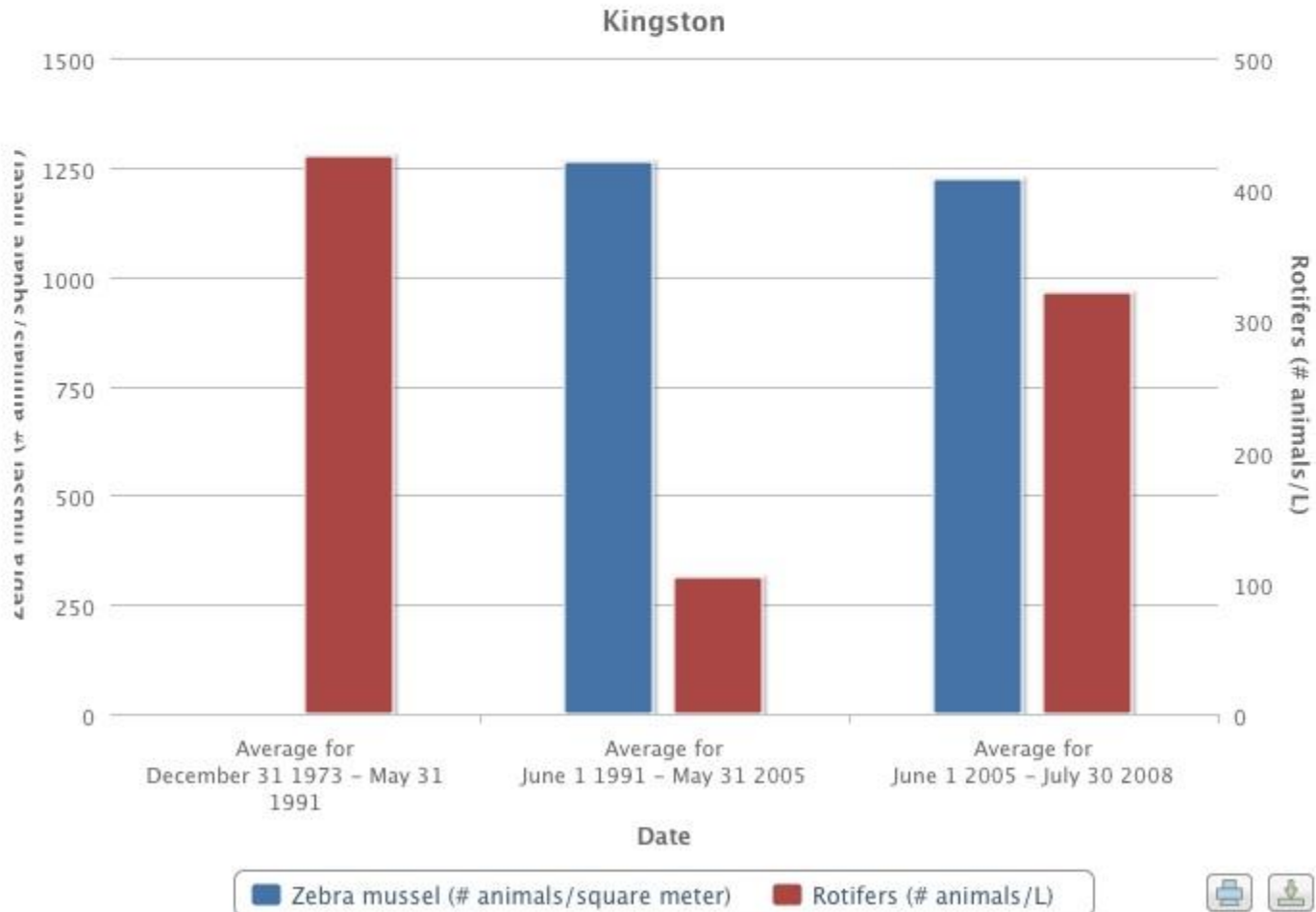
Second parameter: Rotifers (# animals/L)

(Optional) Choose a "Split Date" to average the data:

No split date (Show line graph, no averaging)

Split Date #1 1991.06.01

Split Date #2 2005.06.01 (optional)



Theory of Teacher Learning and Change



COMMON CORE STATE STANDARDS FOR

English Language Arts
&
Literacy in History/Social Studies,
Science, and Technical Subjects



CCSS Reading Standards 1 & 2

1) Cite specific textual evidence to support analysis of science and technical texts.

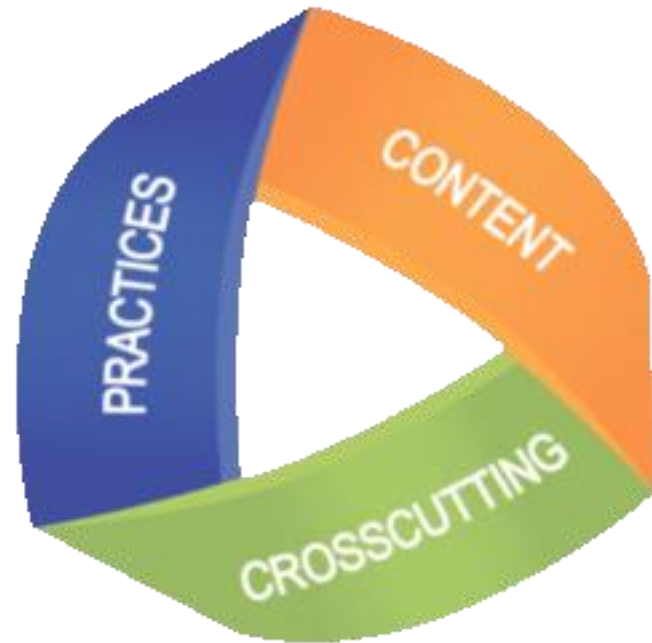
2) Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

CCSS Writing Standard 1

Write arguments to support claims with clear reasons and relevant evidence.

- Introduce claim(s) and organize the reasons and evidence clearly.
- ***Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of the topic or text.***
- Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons.
- Establish and maintain a formal style.
- Provide a concluding statement or section that follows from the argument presented.

NEXT GENERATION SCIENCE STANDARDS



• Scientific and Engineering **Practices**

• **Crosscutting Concepts** that unify the study of science and engineering through their common application across fields

• **Disciplinary Core ideas** in four content areas:

- Physical sciences
- Life sciences
- Earth and Space science
- Engineering, technology and applications of science

NEXT GENERATION SCIENCE STANDARDS

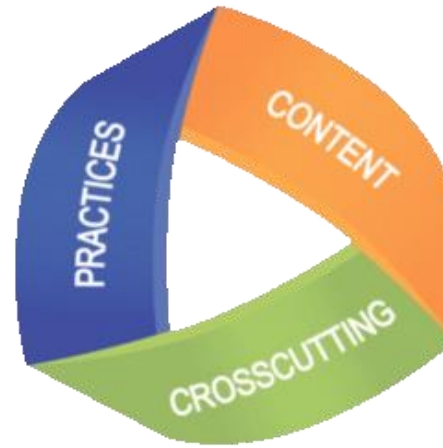
Middle School Life Science

Use a model to support explanations of the effect of resource availability on organisms and populations of organisms in an ecosystem.



Science Practices	Disciplinary Core Ideas	Crosscutting Concepts
<ul style="list-style-type: none">Developing and Using Models	<ul style="list-style-type: none">Interdependent Relationships in Ecosystems	<ul style="list-style-type: none">Cause and Effect

NEXT GENERATION SCIENCE STANDARDS

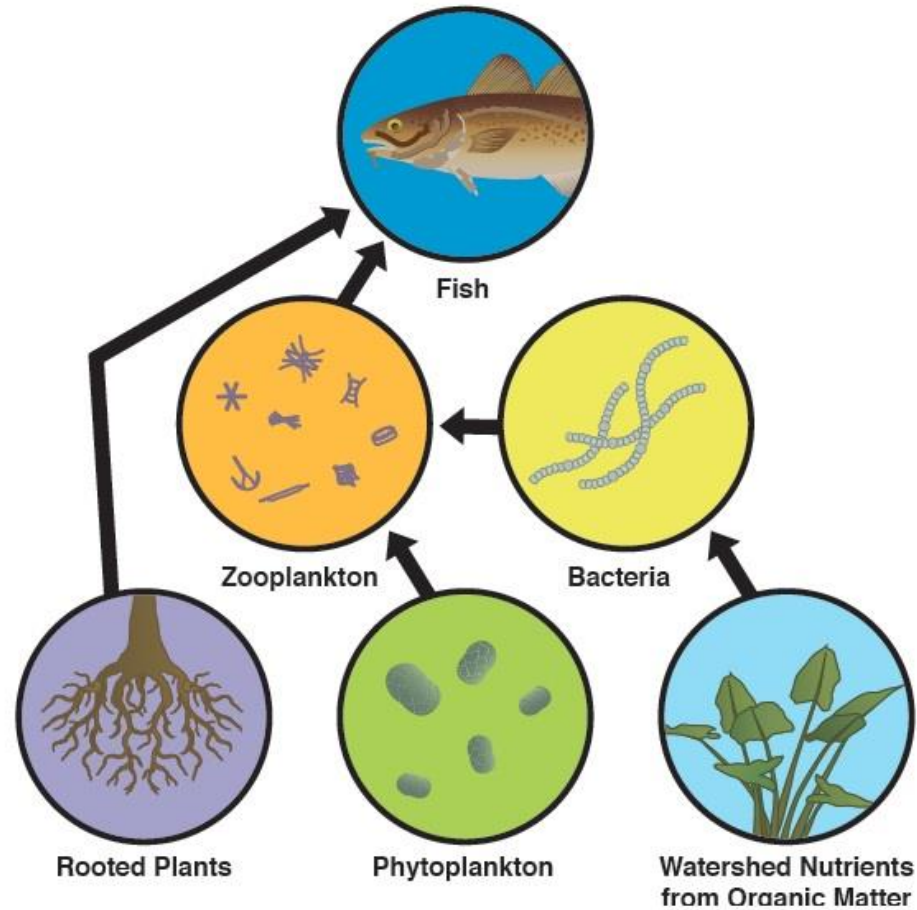


MS-LS2-a.

Use a model to support explanations of the effect of resource availability on organisms and populations of organisms in an ecosystem.

Emphasis is on cause and effect relationships between resources and populations in ecosystems in terms of changes in the numbers of individuals in the population during periods of abundant resources and scarce resources. **Models may include representations of ecosystems and /or graphs and charts showing the flow of matter in food webs or food chains for which students explain the cause and effect of various events and/or conditions.**

Using a Model



HUDSON RIVER ECOSYSTEM FOOD WEB

Developing a Scientific Explanation Tool (DSET)

What is the question?

What effect do zebra mussels have on phytoplankton in the Hudson River ecosystem?

Components of a scientific explanation

<p>Claim</p> <p><i>What is the answer to your question?</i></p>	<p>Evidence</p> <p><i>What is the raw data that supports a particular claim?</i></p>	<p>Scientific Reasoning</p> <p><i>What are the scientific principle(s) that form a logical argument about the relationship between the claim and evidence?</i></p>
<p>Zebra mussels cause the concentration of phytoplankton in the Hudson River to decrease significantly...</p>	<p>Concentrations of phytoplankton in the Hudson River (measured in micrograms chlorophyll-a per liter) prior to the arrival of the zebra mussels in 1992 was between 15 and 17 micrograms per liter. After the zebra mussel became established in 1992, with a long-term average of approx. 1,300 zebra mussels per square meter, concentrations of phytoplankton were less than 5 micrograms chlorophyll a per liter...</p>	<p>Organisms and populations of organisms are dependent on their environmental interactions both with other living things and with non-living factors. Growth or organisms and population increases are limited by access to resources. Zebra mussels are filter feeders that feed on suspended organic particles in the water, including phytoplankton.</p> <p>Based on the fact that zebra mussels depend on plankton for food, and that the graph shows that when the number of zebra mussels increased, the amount of phytoplankton (as indicated by chlorophyll) decreased, this supports our claim that the zebra mussels caused this decrease to occur.</p>

Re-Defining Field Trips

Access to Science Institutions

Four Types of Vouchers

- School Group Vouchers
- Student & Family Vouchers
- Family Field Trip Vouchers
- Teacher Vouchers

AND

- Free Bus Transportation for Family Field Trips



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No. _____

CLASS VISIT / ADMISSION VOUCHER

Date of Visit: _____

School Name: _____ School Number: _____

Teacher: _____

Number of Children: _____ Number of Adults: _____

EMPHASIS ON: NO CASH VALUE

WWW.URBANADVANTAGENYC.ORG

Admits class plus adult chaperones (up to 40 people per voucher) to one of the following institutions:

- American Museum of Natural History
- Bronx Zoo
- Brooklyn Botanic Garden
- New York Aquarium
- New York Botanical Garden
- New York Hall of Science
- Queens Botanical Garden
- Staten Island Zoo

See reverse side for special instructions for each institution.

RE-DEFINING FIELD TRIPS



METRO DENVER URBAN ADVANTAGE
MIDDLE SCHOOL SCIENCE

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From an ill-defined free-for-all..



..to a way to spark inquiry
and investigation.

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Local science-rich institutions
not just destinations—



places for *learning science*



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How can the museum, zoo,
and gardens provide the
scaffolding teachers
need to connect
back to the
classroom?



Metro Denver Urban Advantage is funded by the National Science Foundation's
Discovery K-12 Research Program through grant # DRL 1020386.

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Orientation Video

Demystifying
Clarifying
Fun



Metro Denver Urban Advantage is funded by the National Science Foundation's Discovery K-12 Research Program through grant # DRL 1020386.

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Field Trip Template

Scaffolding the
experience—
yet still
open-ended
and free
choice.

Site Visit Template:

I notice...	...that makes me wonder...
What question interests you most?	
Why does this topic matter to you?	

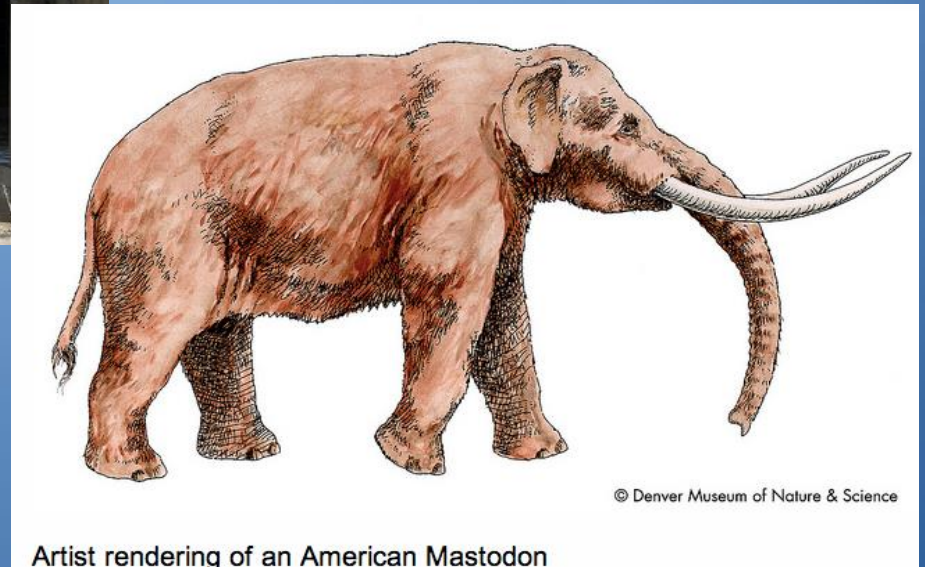
Metro Denver Urban Advantage is funded by the National Science Foundation's Discovery K-12 Research Program through grant # DRL 1020386.

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Artist rendering of an American Mastodon





THE SNOWMASTODON PROJECT™

DENVER MUSEUM OF NATURE & SCIENCE



MAMMOTHS AND MASTODONS

TITANS OF THE ICE AGE

February 15 - May 27, 2013

EXHIBITION FEATURES

The Snowmastodon Project®

Top 10 Things to See
and Do

The Snowmastodon
Project®



^ Back to Top

Impact on Teachers & Students

Denver Efficacy Study
NYU Impact Evaluation

RESEARCH QUESTIONS

1. Impact of Urban Advantage on

students

2. Impact of Urban Advantage on

teachers

3. Impact of Urban Advantage on

families



THE METRO DENVER URBAN ADVANTAGE
MIDDLE SCHOOL SCIENCE
EFFICACY STUDY

RANDOM ASSIGNMENT OF SCHOOLS

Urban Advantage



Comparison



THE METRO DENVER URBAN ADVANTAGE
MIDDLE SCHOOL SCIENCE
EFFICACY STUDY

DATA COLLECTION EFFORTS



Standardized
Student
Science
Assessment



Pre-Post
Student
Science
Assessment



Pre-Post
Student
Surveys



Pre-Post
Teacher
Surveys



Post-only
Parent
Surveys

THE METRO DENVER URBAN ADVANTAGE
MIDDLE SCHOOL SCIENCE
EFFICACY STUDY

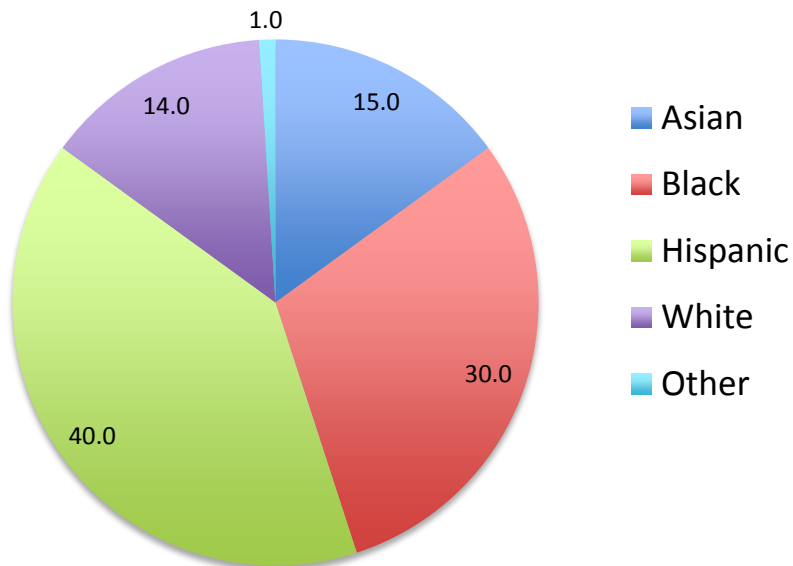
urban  **advantage**
 middle school science initiative
New York City

School Year	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Schools	31	111	129	156	147	174	156	137	123
New Teachers	62	133	116	127	61	182	86	63	111
Continuing Teachers		62	94	129	196	204	285	280	253
Total Teachers	62	195	210	256	257	386	371	343	364
UA Students	5,500	18,722	21,016	27,541	24,793	37,582	37,822	35,824	33,295

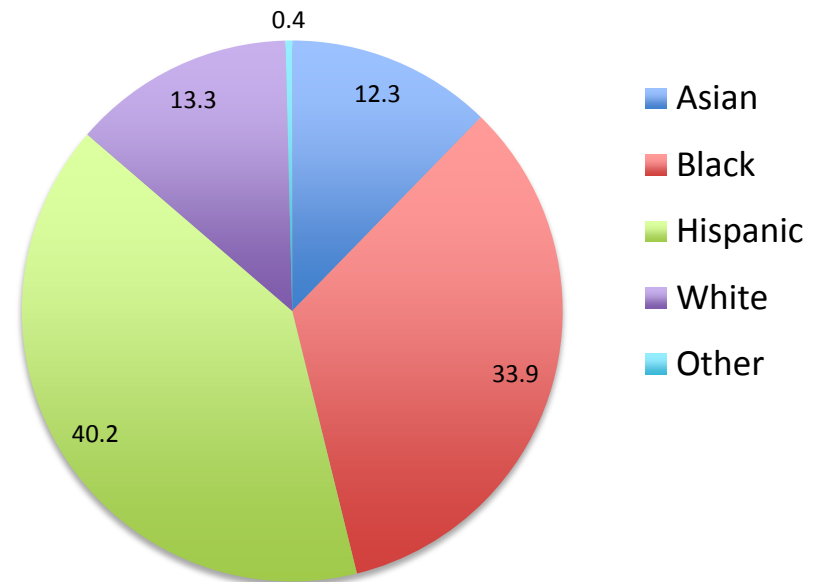
In FY13, 22% of all NYC middle schools participate in UA

Demographic Data: UA Schools vs. non-UA Schools

Demographic Data - NY Citywide (FY2010)
(Percent)

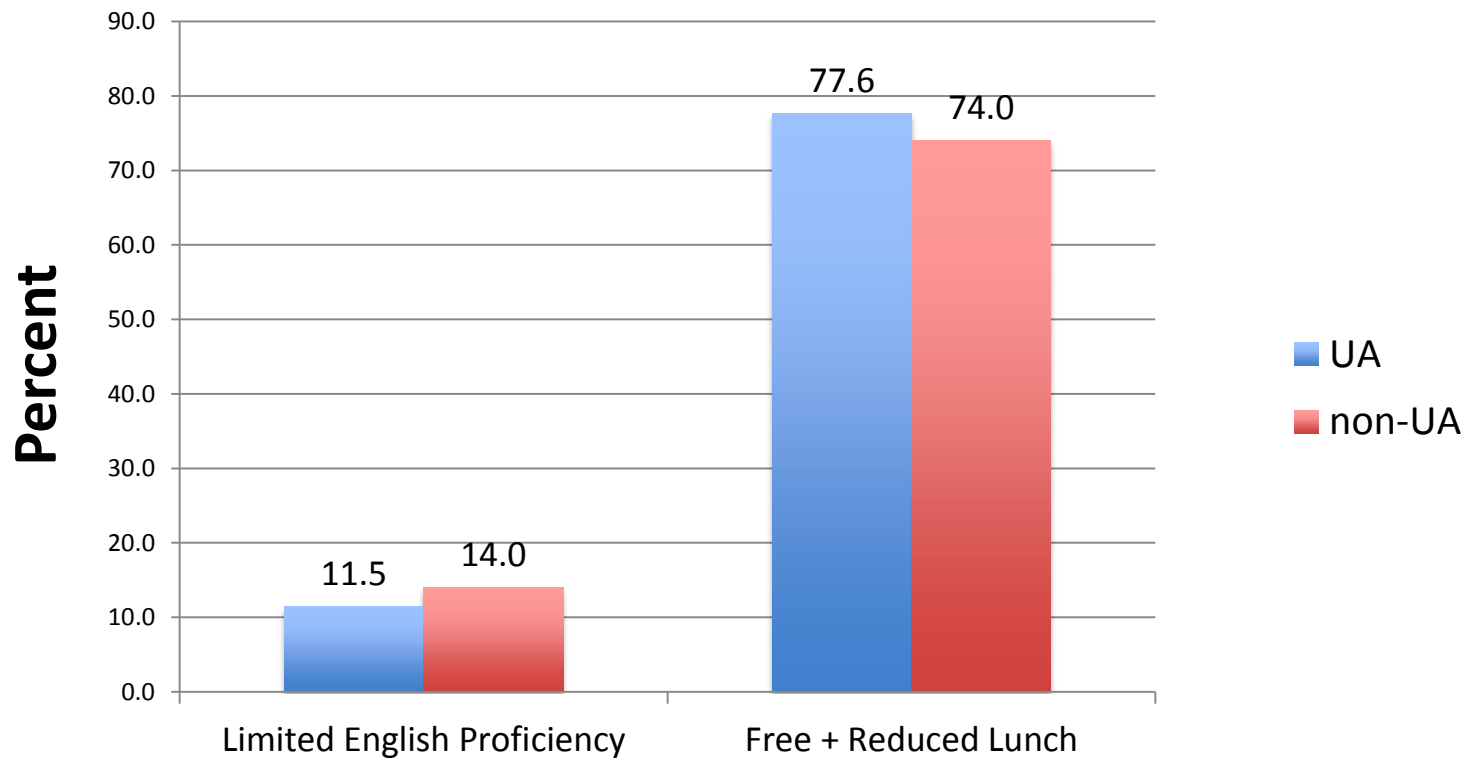


Demographic Data - UA Schools (FY2010)
(Percent)

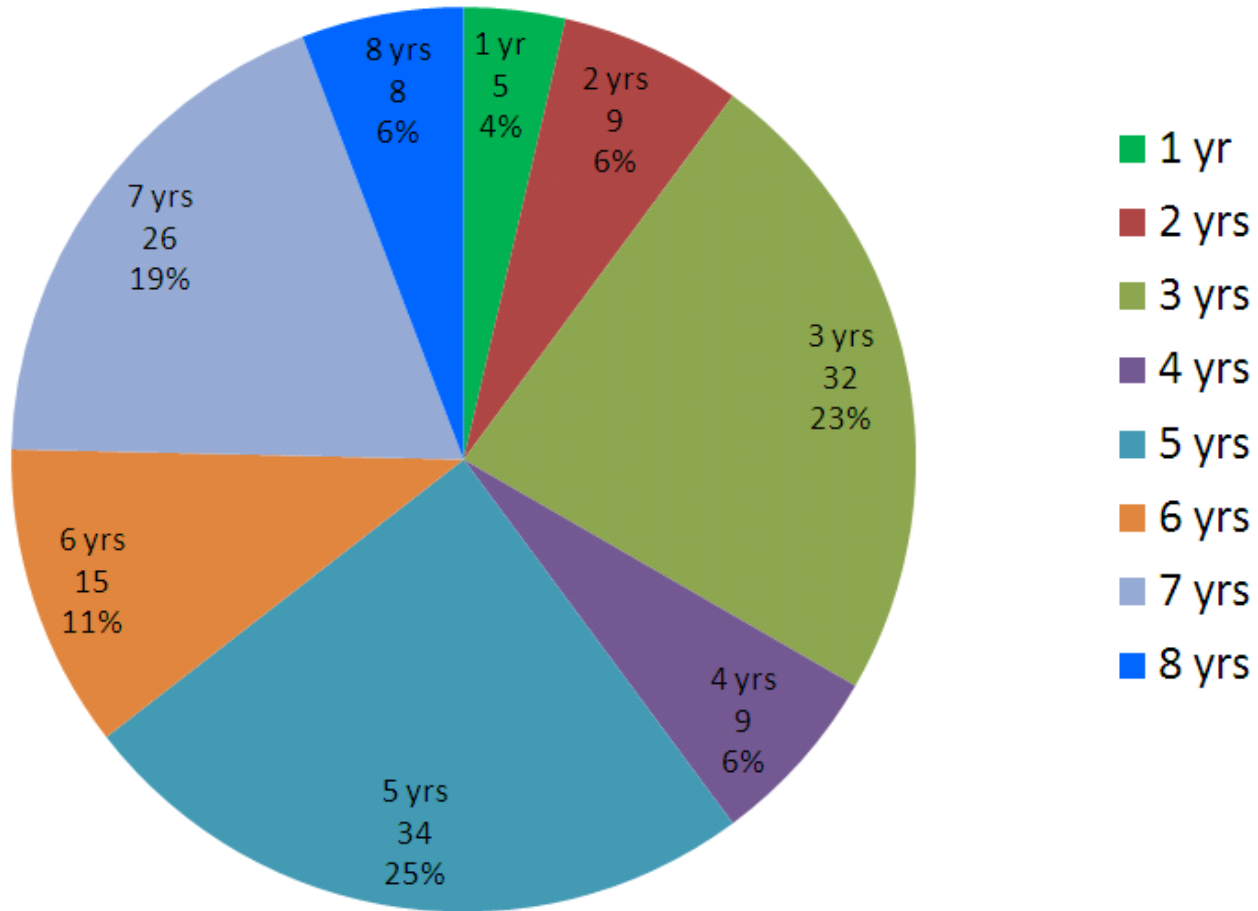


UA New York City

Language and Free/Reduced Lunch: UA Schools vs. non-UA Schools

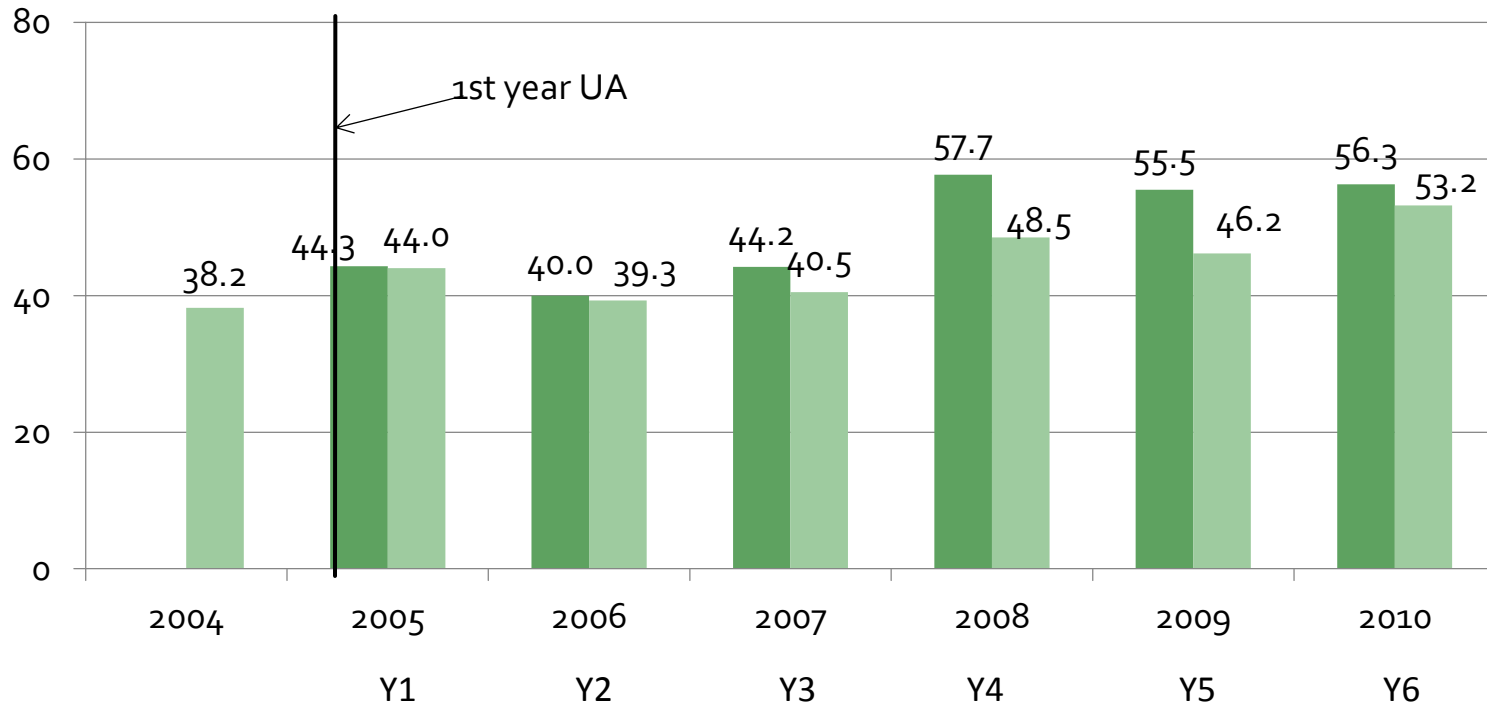


2012 Schools by Years of Participation



Raw performance data suggests UA is effective

Student Weighted Mean Achievement, 8th Grade Intermediate Level Science (ILS) Test – Percent Proficient



■ UA ■ Non-UA
UA New York City

Linear Probability Coefficients, High School Outcomes

	Model 1	Model 2
	β /s.e	β /s.e
Attending a STEM School	0.014*** (0.003)	0.008* (0.004)
Attending a Partial STEM School	NS	NS
Taking Living Environment Regents in 8 th or 9 th Grade	0.255*** (0.012)	0.246*** (0.012)
Passing Living Environment Regents	NS	NS
Passing Living Environment Regents with 65 or higher	0.040*** (0.006)	0.032*** (0.006)
Passing Living Environment Regents with 85 or higher	0.062*** (0.005)	0.054*** (0.005)
Taking Earth Science Regents in 8 th or 9 th Grade	0.039*** (0.007)	0.033*** (0.007)
Passing Earth Science Regents	0.029*** (0.0006)	0.012* (0.0006)
Passing Earth Science Regents with 65 or higher	0.059*** (0.007)	0.037*** (0.008)
Passing Earth Science Regents with 85 or higher	0.062*** (0.005)	0.054*** (0.005)
School Fixed Effects	YES	YES

* p<0.05, ** p<0.01, *** p<0.001

Robust clustered standard errors in parentheses

Control variables not shown are: Black, Hispanic, Asian, Female, Poor, Special Education, LEP, and for Model 1 lagged_zmath.

Post 8th Grade Outcomes

- Students at UA schools were found to be 25.5% more likely to take the Living Environment Regents exam in 8th or 9th grade and showed significantly higher levels of proficiency than students in non-UA schools.
- There is an increased probability of UA students attending STEM high schools.

Table Discussions

1. Choosing the “right” STEM partners to collaborate
2. Determining the curricular focus of a STEM partnership
3. Building and sustaining a STEM partnership program
4. Funding a STEM partnership program
5. Designing a STEM partnership program for scale
6. Assessing the impact of a STEM program on student learning and teacher practice