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Conducting an Applied Research Study on Online Professional Development



Lauren Goldenberg
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EDC Education Development Center



Conducting an OPD Applied Research Study

- NSF DRK-12
- Impact of WGBH Teachers' Domain *Teaching HS Biology* course
- Experimental design

Professional Development Opportunity in Science

Who can participate?

- New York State public high school 9th or 10th grade biology teachers whose students are eligible to take the Living Environment Regents Examination

What do teachers receive?

- Teachers receive a free online professional development course from PBS TeacherLine New York in high school biology that helps teachers develop inquiry-based approaches to teaching genetics and evolution.
- A stipend ranging from \$200 to \$600, based on yearly tasks, for each year of participation in the study.



<http://teacherline.nytearns.org/ABE1NY.asp>

What will participating in this 2-3 year study involve?

- Teachers will be offered an online professional development course in either summer 2008 or summer 2009. The course will take up to 45 hours over 7 weeks.
 - The course will focus on teaching genetics and evolution using inquiry-based approaches. Some teachers will receive additional modules on teaching science.
 - For the purposes of this study, the additional modules as well as which summer teachers take the course will be assigned by lottery.
 - Teachers will have a choice of two start dates for the course.
- Teachers will take two assessments, one before and one after the course.
- In the academic year following the course, teachers' Living Environment students will take two brief assessments, one at the beginning and one at the end of the school year. The assessments will consist of questions like those on the Living Environment Regents Examination and will cover genetics and evolution concepts.
- Teachers will complete a survey at the beginning and end of each school year.
- Teachers will work with the research team to obtain appropriate consent from students' parents/guardians.
- The research team will help teachers obtain the necessary administrative approval to participate.

Who is supporting this study?

- This study is supported by the National Science Foundation (NSF), The Education Development Center's Center for Children & Technology in partnership with PBS TeacherLine New York and the Buffalo PBS affiliate WIEB to conduct the study.

What is this study about?

- The goal of this research study is to learn more about what teachers gain from online professional development and whether it impacts student learning.



<http://teacherline.nytearns.org/ABE1NY.asp>

To ensure your participation, please register by April 15th. For more information, please contact: Roshni Monon, EDC at ABE-1NY@edc.org or 212-807-4233

ABE-1NY

Advancing Biology Education through Online Professional Development: A New York State Research Study



Bring new science professional development and resources to your school

Professional Development Course sample screen

Application:

Evidence

- [Session 1](#)
- [Invitation](#)
- [Exploration](#)
- [Explanation](#)
- [Application Evidence](#)
- [Putting It into Practice](#)

As you've seen, scientists begin with observations, which lead to questions and the development of a hypothesis. They then develop a plan to seek evidence that supports or refutes the hypothesis.

Before going on to the next two resources, think about what you know about scientific evidence.

- What kinds of evidence did the scientists you've encountered so far in this session seek?
- What evidence are you seeking in your seed experiment?
- What different kinds of evidence might provide convincing support for a hypothesis that explains, for example, the extinction of the dinosaurs?

Interactive

This interactive feature looks at how scientists have used evidence to support their hypotheses about events in the past.



What Killed the Dinosaurs?

[View](#)

[See resource page](#)

Video

This video describes how a scientist used evidence from a field study to test his hypothesis.



The Red Queen

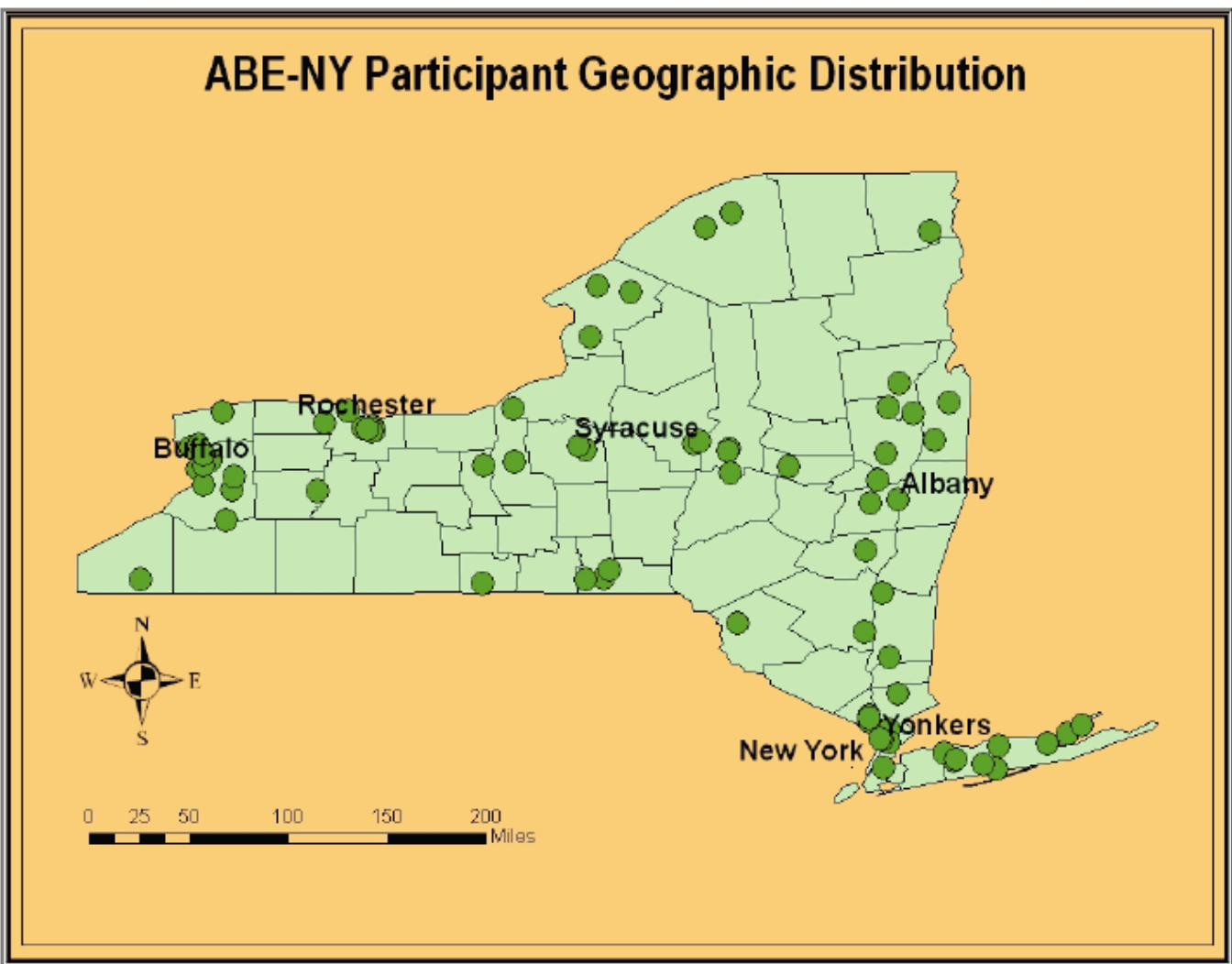
[View](#)

[See resource page](#)

Research Questions

1. Does participating in the online course **increase teacher knowledge of biology, instruction, and digital media use?**
2. Is **student learning** influenced by teachers' participation in the online professional development course?

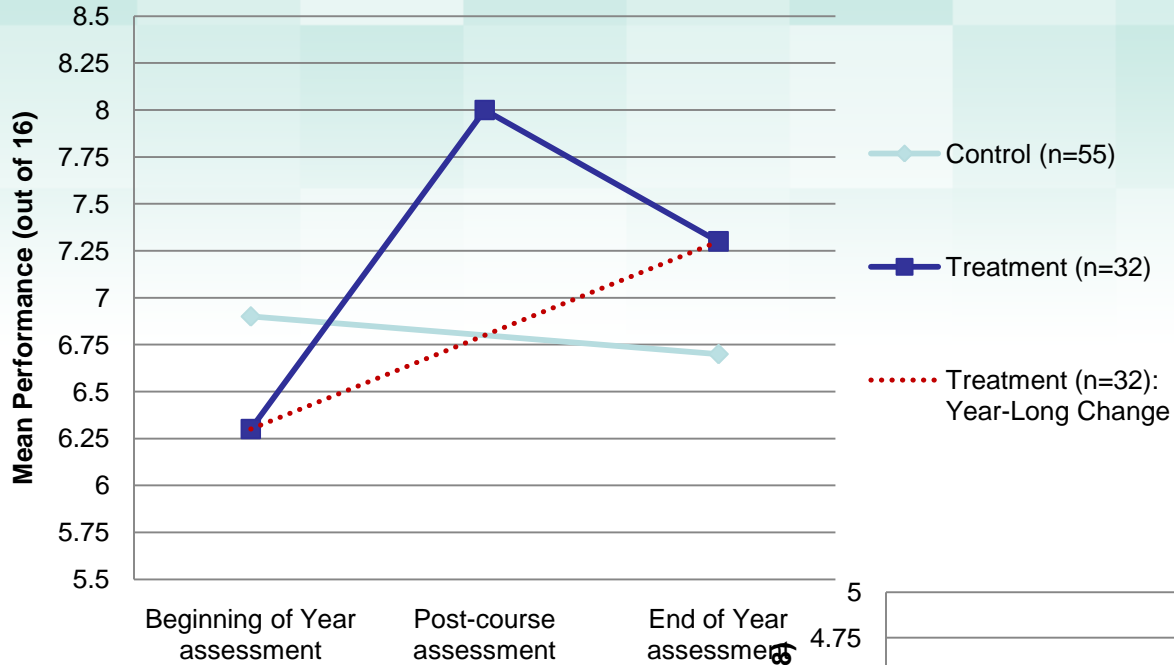
Study Participants



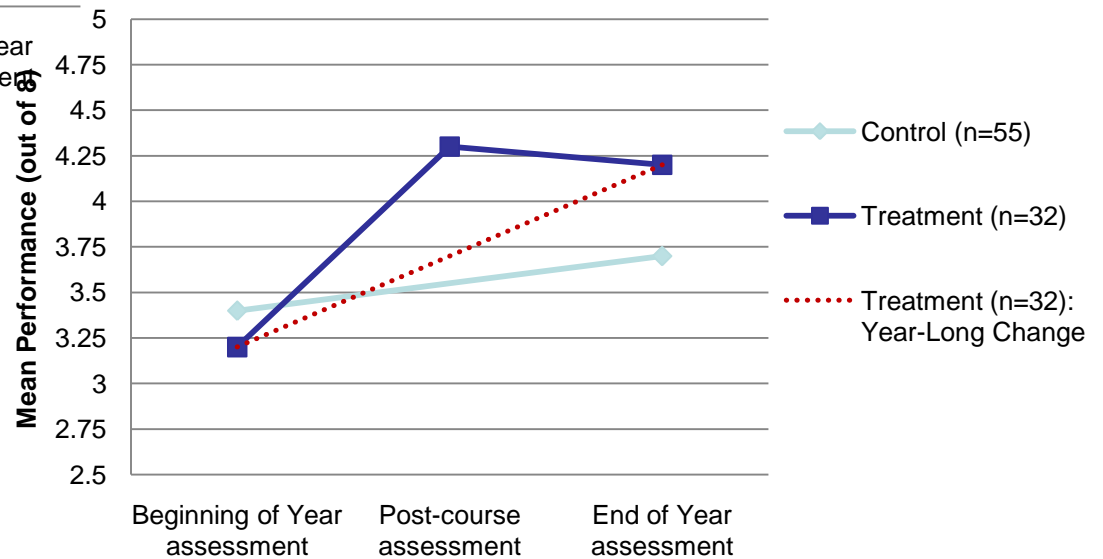
Teacher Results

Year 1 Data

Pedagogical Content Knowledge



Use of Digital Resources



Student Results (preliminary)

Year 1 Data

- No significant difference in biology content knowledge/growth in knowledge.
- Higher year-end scores, stronger growth
 - Higher positive attitudes
 - 9th graders

Statement	Strongly Agree	Agree	Neutral/Not Sure	Disagree	Strongly Disagree
1. Money spent on science is well worth spending.	5	4	3	2	1
2. I would prefer to find out why something happens by doing an experiment than by being told how it works.	5	4	3	2	1
3. I find it boring to hear about new ideas.					
4. Science lessons are fun.					
5. I would like to belong to a science club.					
6. I would dislike being a scientist.					
7. Science is man's worst enemy.					
8. Doing experiments is not as good as finding out information from teachers.					
9. In science experiments, I like to use new methods which I have not used before.					
10. I dislike science lessons.					
11. I get bored watching science programs at home on TV.					
12. I would like to work with people who make discoveries in science.					
13. Public money spent on science in the last few years has been used wisely.					
14. I would prefer to do experiments rather than to read about them.					
15. I am unwilling to change my ideas when evidence shows that the ideas are wrong.					
16. School should have more science lessons each week.					
17. I would like to be given a science book or a piece of science equipment as a reward.					
18. I would dislike a job in a science laboratory.					
19. Scientific discoveries are doing more harm than good.					
20. I would rather agree with other people than do an experiment to find out for myself.					
21. In science experiments, I report unexpected results as well as expected ones.					

5. If mitotic cell division is the only way a particular species of single-celled organism can reproduce, likely that

- (1) mutations can not occur in this species
- (2) the rate of evolution in this species is slower than in one that reproduces sexually
- (3) the number of organisms of this species in an area will remain constant
- (4) this species belongs to the animal kingdom

6. Two different types of cells from an organism are shown below.



Explain how these two different types of cells can function differently in the same organism even though both contain the same genetic instructions.

7. The chart below shows relationships between genes, the environment, and coloration of tomato plants.

Inherited Gene	Environmental Condition	Final Appearance
A	Light	Green
B	Light	White
A	Dark	White
B	Dark	White

Which statement best explains the final appearance of these tomato plants?

- (1) The expression of gene A is not affected by light.
- (2) The expression of gene B varies with the presence of light.
- (3) The expression of gene A varies with the environment.

Case Study Research Questions

1. How are **teachers using digital resources** during their genetics and evolution units **to enhance student engagement and learning**?
2. **What pedagogical strategies do teachers** use during their genetics and evolution units, in **lessons involving digital resources** and those not involving digital resources?

Case Studies: Methods

- Teacher interviews
- Observations
- Student focus groups
- Artifact packages

Lesson Plan: The Fossil Evidence for Evolution

Overview

The next three lessons help students understand how scientists find evidence of evolution and piece together the history of life. In this lesson, students learn about the fossil record, the primary form of evidence. The lesson begins with an overview of the fossil formation process, then covers the evolution of the swimming animals from fish, and finally looks at how some mammals (whales) ended up back in the water.

Objectives

- Learn how scientists use fossil evidence to trace the evolution of various species
- Understand methods used to date fossils

Suggested Time

- Two to three class periods

Multimedia Resources

- QuickTime Video
- QuickTime Video
- PDF Document
- HTML Docum
- QuickTime Video
- PDF Document



Teacher Reflection on Student Work

Date: 2/12/10

Quality of this work? (circle) High Medium Low

Why did you rate it this way?

This student copied the definitions exactly from the text book.

Before the Lesson

- Make copies of (PDF) worksheet

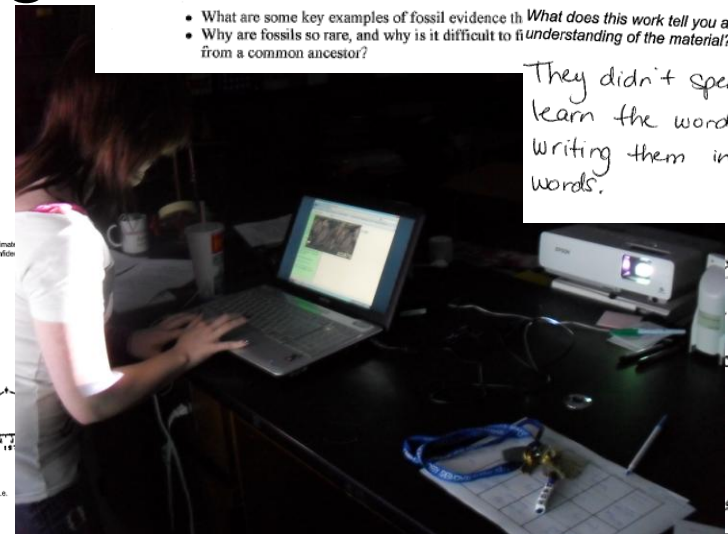
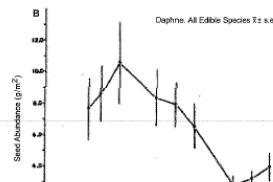
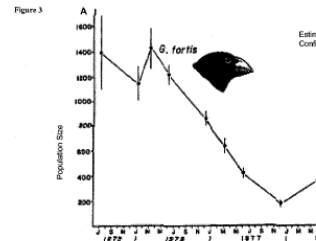
After the Lesson

Discuss these general questions about fossil evidence:

- What are some key examples of fossil evidence that tell you about the student's understanding of the material?
- Why are fossils so rare, and why is it difficult to find fossils from a common ancestor?

They didn't spend time to learn the words but writing them in their own words.

evolution



rs haven't been di
of an object or a
as established by
structures in one
s in another spe

Let's talk

- Next steps*
- DL/DigiRes Research Agenda?
- Research methods:
 - Recruitment
 - Retention/attrition*
 - Instrumentation
 - Data collection procedures
 - Research design decisions
 - Advisory board role

ID # (to be filled in by EDC):

Advancing Biology Education through Online Professional Development:
A New York State Research Study
End of Year Questionnaire 2009

First Name: Last Name: ID # (to be filled in by EDC):

Thank you for your continued participation in the *Advancing Biology Education through Online Professional Development: A New York State Research Study*.

This end of year questionnaire consists of three parts:

- Part One contains questions about your participation in the course.
- Part Two contains questions about your teaching practice.
- Part Three asks questions about your perceptions of the course.

Answer the items in this questionnaire as copy and paste answers from prior questionnaires. All information received from this questionnaire will be used for research purposes only. All information received from this questionnaire will be used for research purposes only. All information received from this questionnaire will be used for research purposes only.

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4. The diagram below shows a process that can occur during meiosis.

The most likely result of this process is:

(a) a new combination of chromosomes in the daughter cells
 (b) a new combination of chromosomes in the parent cells
 (c) a new combination of chromosomes in the parent cells
 (d) an increase in the number of chromosomes in the daughter cells

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11. I get bored watching science programs at home on TV.	5	4	3	2	1

Discussion: Retention/Attrition Persistence, by cohort

	Cohort 1		Cohort 2	
	N	% Persistence	N	% Persistence
Assigned to Group*	70	-	74	-
Completed course (Summer 2008)	34	48%	-	-
Completed activities, Sept 2008 – June 2009	32	45%	52	70%
Completed course (Summer 2009)	-	-	38	51%
Completed activities, Sept 2009 – May 2010**	28	40%	36	49%