

and what requires further investigation. Online courses can

- help teachers develop or refresh their knowledge about content and instruction;
- provide a means for teachers in rural areas or with otherwise limited access to professional learning experiences to refresh their knowledge about content and instruction;
- allow teachers who use their face-to-face professional development time for hands-on scientific research opportunities the chance to connect with other teachers around teaching; and
- impact student learning, if the professional learning opportunity occurs over a sufficient amount of time.²

Combining the characteristics of powerful professional development with what's effective in online learning is a strategy that shows promise. Teachers in many schools, districts, and states are already fusing Web-based opportunities for professional learning with face-to-face activities such as coaching, workshops, and professional learning communities in a model commonly known as *blended or hybrid learning*. Our next steps for research include investigating the promising practices of blended professional development—essentially, how an array of teachers' professional learning experiences, online and offline, might work in concert.

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PBS TeacherLine

teacherline.org



FOR MORE INFORMATION

To find out about our research methods and to download papers and presentations, please visit the Advancing Biology Education (ABE) Research Project: A Study of Online Learning for Teachers study website: <http://abeny.cct.edc.org>

For more information about online learning for teachers and the resources mentioned in this handout, visit these sites:

EDC	ltd.edc.org/professional-learning-online-environments
PBS TeacherLine	www.pbs.org/teachers/research
WGBH Teachers' Domain	www.teachersdomain.org
PBS LearningMedia	www.pbslearningmedia.org
Learning Forward	www.learningforward.org/advancing/recentresearch.cfm

ABOUT EDC AND EDC'S CENTER FOR CHILDREN & TECHNOLOGY

Education Development Center, Inc. is a global nonprofit organization that develops, delivers, and evaluates innovative programs to address urgent challenges in education, health, and economic development. EDC manages more than 300 projects in 35 countries.

For more than 30 years, EDC's Center for Children and Technology has been at the forefront of creating and researching new ways to foster learning and improve teaching through the development and thoughtful implementation of new educational technologies.

**WE THANK THE TEACHERS AND STUDENTS WHO PARTICIPATED IN THIS STUDY.
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² O'Dwyer, L. M., Masters, J., Dash, S., De Kramer, R., Humez, A., Russell, M. (2010). *e-Learning for Educators: Effects of Online Professional Development on Teachers and their Students*. Boston, MA: Technology and Assessment Study Collaborative, Lynch School of Education, Boston College. Downloaded from: <http://www.bc.edu/research/intasc/researchprojects/eLearning/efe.shtml>



MAKING CHOICES ABOUT ONLINE PROFESSIONAL LEARNING: FINDINGS FROM THE ABE RESEARCH STUDY

HOW EFFECTIVE IS ONLINE PROFESSIONAL DEVELOPMENT AT HELPING TEACHERS

LEARN, AND WHAT IS THE IMPACT ON THEIR STUDENTS? This question loomed large in the minds of many administrators, policy makers, and developers of professional learning experiences for teachers when we began our study of online professional development in 2007. And it remains an issue today, in an era of new standards, new regulations, and tightened budgets.

In order to help answer this question, a group of researchers at the Education Development Center, Inc.'s Center for Children and Technology set out to understand the impact of an online course on high school biology teachers' understanding of two focal content areas—genetics and evolution—their understanding of how to teach these topics, and how to use digital resources to support teaching and learning. We also investigated whether taking the course had an impact on their students' learning about genetics and evolution.

The study showed that teachers who took the course increased their knowledge of genetics and evolution, science instruction, and how to use digital resources. This increase in knowledge did not lead to correspondingly larger gains for their students.

With the Common Core and Next Generation Science standards on the horizon, along with new regulations about measuring teacher effectiveness, teacher professional learning is more critical than ever.

- *Online courses such as Teaching High School Biology show promise* in helping teachers, especially those in rural areas, develop or refresh important knowledge about content and instruction and connect with other teachers.

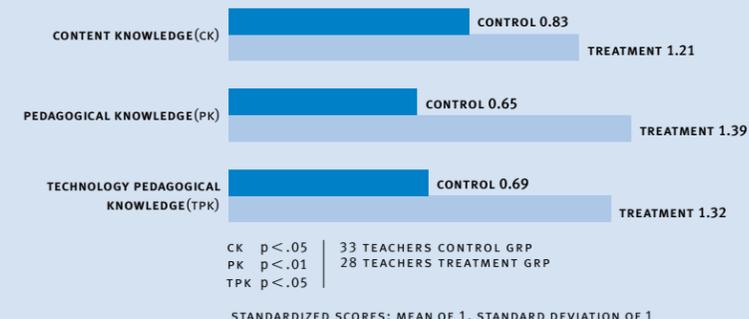
- *Online professional learning allows teachers to use their face-to-face professional development time* for hands-on scientific research opportunities and working with colleagues locally.

Looking ahead, we plan to continue to investigate the opportunities and challenges of online and blended (online and onsite) learning experiences for teachers.

Read inside to find out more about the study.

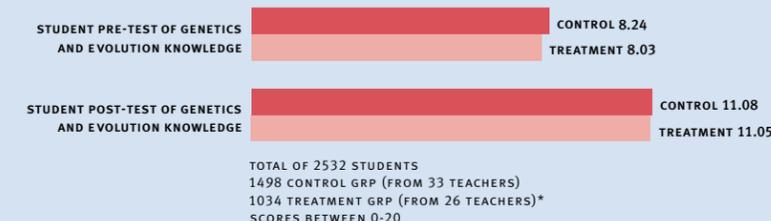
TEACHER FINDINGS

MEAN SCORES ON END-OF-YEAR ASSESSMENT, MAY 2009



STUDENT FINDINGS

MEAN SCORES ON END-OF-YEAR ASSESSMENT, MAY 2009



* The students of two teachers who taught in alternative education settings were excluded from the student analysis.

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THE ABE STUDY

One-hundred and forty-four teachers signed on to participate in the study and take the online course. The high school biology teachers—new and veteran—hailed from cities, suburbs, and rural areas from around New York State. Their students and schools represented the broad racial, ethnic, linguistic, and economic diversity that exists in New York. Twenty-eight teachers in the treatment group and 33 in the control group completed the online course and all data collection. Results are based on data from these 61¹ teachers and their 2,532 students.

The study used an experimental design to answer the research questions, meaning we randomly assigned teachers via a lottery either to a treatment group, who took the course in summer 2008, or to a control group, who took the course in the summer of 2009. We also randomly assigned teachers to take a short or long version of the course (see *About the Course*, below). In the 2009-2010 school year, eight teachers volunteered to participate in case studies of their genetics and evolution units.

RESEARCH QUESTION 1

Does participating in the online course result in increased teacher knowledge of (a) genetics and evolution, (b) pedagogy, and (c) use of digital resources in teaching?

FINDING

Teachers in the treatment group increased their understanding in all areas, compared to teachers in the control group.

HOW WE ARRIVED AT THESE RESULTS

Teachers took an assessment to measure their knowledge of genetics and evolution, pedagogy, and use of digital resources, before and after they took the online course, and again at the end of the school year. Teachers also filled out a questionnaire about their educational background and teaching experience. To determine the effect of the online course on teachers' learning, we compared the means of their assessment scores at the end of the school using a statistical technique called multivariate analysis of covariance (MANCOVA), which tests for significant difference between group means on multiple outcome variables (e.g., teacher knowledge of genetics and evolution, of instruction, and of using digital resources) while statistically adjusting for pre-existing differences in the teachers.

RESEARCH QUESTION 2

Does the length of the course make a difference?

FINDING

We found no significant differences on any of the outcome measures between teachers who took the long or short versions of the course (see *About the Course*).

HOW WE ARRIVED AT THESE RESULTS

Teachers were randomly assigned to take one of two versions of the course. We wanted to investigate whether the duration and content of the online course and the type and amount of information had any influence on teacher learning. Figure 1 shows the content of the two course versions.

RESEARCH QUESTION 3

Does teachers' participation in the online course lead to increased student knowledge of genetics and evolution?

FINDING

We found no statistically significant difference in students' learning based on their teacher's participation in the online course.

HOW WE ARRIVED AT THESE RESULTS

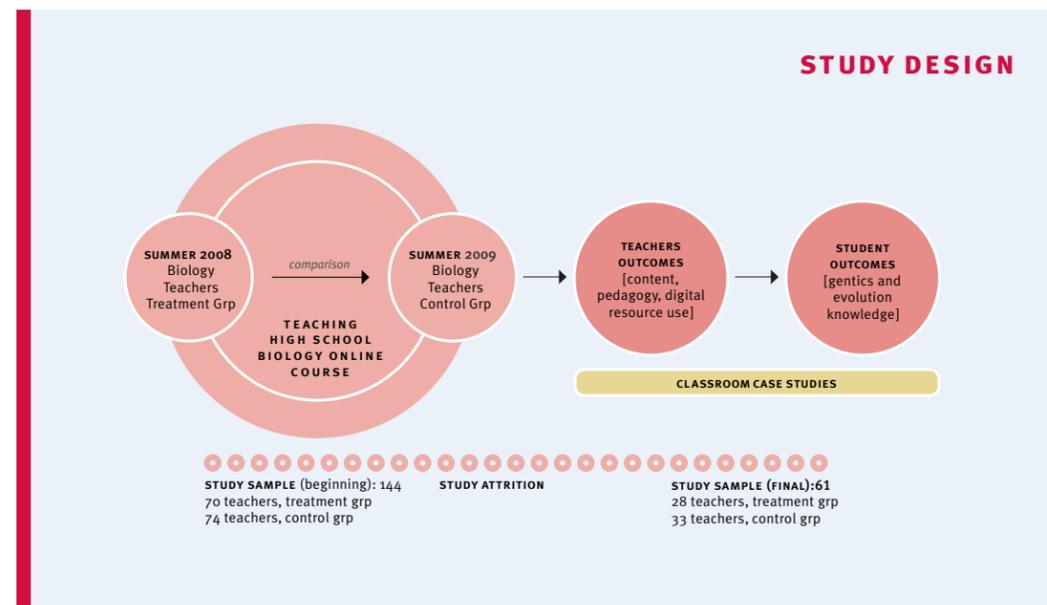
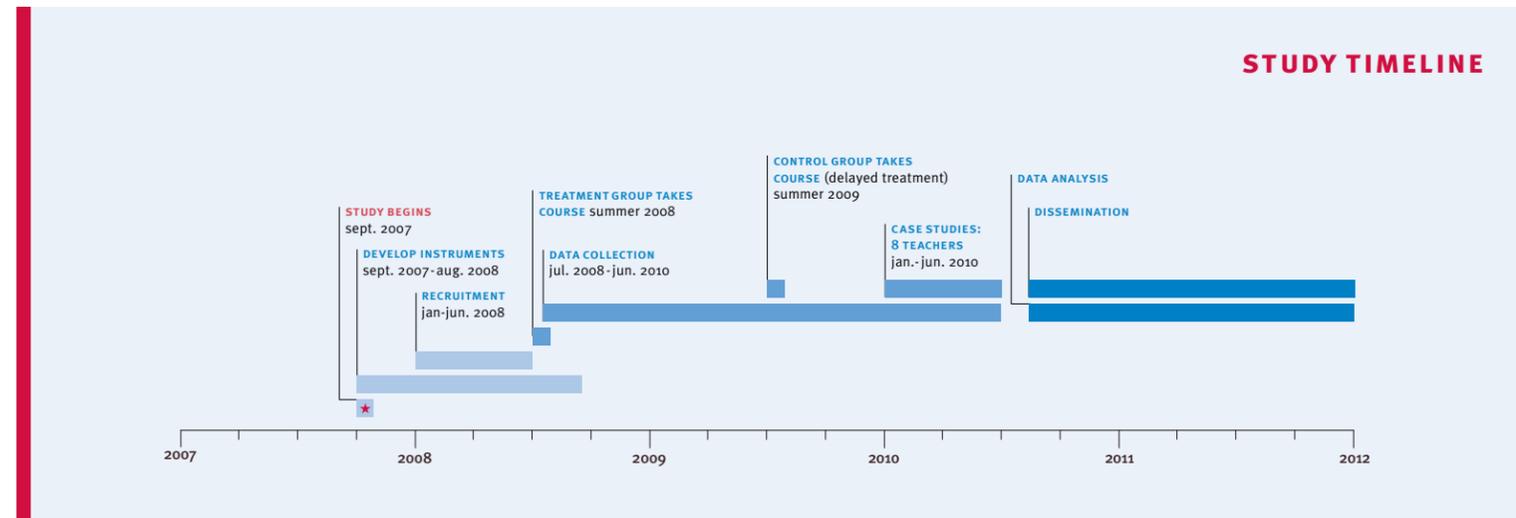
At the beginning and end of the school year, the students took a 20-item test on genetics and evolution. We used a statistical technique commonly known as multi-level modeling, which takes into account the fact that multiple students share the same teacher. Multi-level modeling allowed us to test whether a teacher's participation in the online course was associated with their students' learning. Students also completed a questionnaire about their attitudes toward science; our preliminary analyses showed no correlation between attitudes toward science and achievement on the genetics and evolution knowledge test.

RESEARCH QUESTION 4

How are teachers using the instructional strategies and digital resources they learned about in the course?

COURSE CONTENT

Teaching High School Biology Long version: 45 hours	Teaching Genetics and Evolution Short version: 30 hours
SESSION 1 Processes of Science 2 Inquiry-Based Learning 3 Teaching Genetics 4 Teaching Applied Genetics 5 Teaching Evidence for Evolution 6 Teaching Processes of Evolution 7 Lesson Design 8 An Environment for Learning	SESSION 1 Teaching Genetics 2 Teaching Applied Genetics 3 Teaching Evidence for Evolution 4 Teaching Processes of Evolution



FINDING

The case study teachers reported using more digital resources in their teaching to illustrate difficult concepts and to engage students. Moving toward using inquiry-based instructional strategies was more of a challenge for these teachers; they cited issues such as feeling pressure to teach information for the Regents Examination, student expectations about teaching and learning, and needing more help developing their inquiry skills.

HOW WE ARRIVED AT THESE RESULTS

Eight teachers volunteered to participate in case studies of their genetics and evolution units. The research team interviewed teachers and students, observed lessons, and collected teaching and learning artifacts.

ABOUT THE COURSE

A group of researchers at EDC's Center for Children and Technology, based in New York City, had been collaborating with WGBH, the Boston public broadcasting station, to evaluate *Teachers' Domain*, an online library of digital resources and accompanying professional development materials. We were confident that their *Teaching High School Biology* course presented high-quality content in a supportive pedagogical environment. In the course, participants learn inquiry-based approaches to teaching the topics of genetics and evolution with digital resources (e.g., videos, simulations, animations, interactive activities). They work individually and also communicate with classmates and the course facilitator on a discussion board. PBS TeacherLine (teacherline.pbs.org) distributed the course through its local partner, WNET/PBS TeacherLine NY.

FURTHER CONSIDERATIONS

Teachers are continually learning, in both informal and formal settings. They discuss lessons with colleagues, take workshops and courses, attend conferences, and connect with others on the Internet through listservs, Nings, Facebook, Twitter, and so on.

Does formal online professional development work? The answer is not a simple yes or no. We know that teachers can learn in online settings.

But it is harder to see the link between professional development—online or face-to-face—and increased student achievement. We therefore need to think about the ways online professional learning opportunities can best be designed and used, with the ultimate goal of improving student learning.

QUESTIONS TO ASK ABOUT ONLINE PROFESSIONAL DEVELOPMENT

Here are some things to ask yourself, if you are a teacher considering an online professional learning opportunity.

- Does this contribute to my professional learning goals?
- Are the topics aligned with what I need to teach, and how to teach it?
- Do I get the opportunity to connect with other teachers in my school or district?
- Are there opportunities for trying out new things? Are there then opportunities for feedback and self-reflection?
- What kind of follow-up is there?
- What is the time commitment for this learning opportunity? Can I make time for it?

Additionally, administrators may ask:

- How does this contribute to an overall vision for student learning?
- Does this help create a positive school culture?
- What additional supports might be included in order to leverage the professional learning opportunity?

Research about effective professional development suggests it

- should link subject-matter knowledge and an understanding of student learning needs;
- be connected to teachers' professional experiences and work lives;
- provide opportunities for active learning around authentic teaching and learning tasks;
- encourage collaboration and collective participation; and
- occur over time.

According to recently released professional learning standards from the national staff development organization Learning Forward, additional elements of effective teacher learning include

- sustained support for implementation of professional learning for long-term change, and
- leaders who can skillfully create support systems for growth change.

Studies such as Advancing Biology Education (ABE) Research Project: A Study of Online Learning for Teachers help to add evidence about which online learning strategies are effective

¹ The primary goal of an experimental study is to create treatment and control groups that are comparable at the beginning of the study. Our analyses showed that even though many teachers left the study, the 61 completing teachers formed treatment and control groups that were comparable.