Today’s NSDL Experts

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Web Seminar Overview

• What is Biotechnology?
• Why is it important?
• Teachers’ Domain: Biotechnology
• Practical Applications for every Classroom

http://nsdl.org
What is Biotechnology?
Historically, biotechnology referred to the production of commercial products with the aid of living things.
How familiar are you with Biotechnology? Stamp your answer

<table>
<thead>
<tr>
<th>Very Familiar</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Somewhat familiar</td>
<td></td>
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<tr>
<td>A little familiar</td>
<td></td>
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<tr>
<td>I’m here to learn more!</td>
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http://nsdl.org
Does your school have a Biotechnology Program?

A. Yes
B. No, but I’d like to learn how to start one.
C. No, I’m just hear to learn more about it!

http://nsdl.org
Modern Biotechnology

- Now we are now able to manipulate the **DNA** of organisms or create new organisms for our own use.
Which of the following products are made using biotechnology? Stamp your answers
(Tip: Do not stamp on my picture! 😊)
Why is Biotechnology important for your students?

It is all around us

http://nsdl.org
Biotech Class = Hands-on and Fun!
What degree do you need to work in biotechnology?

A. Certificate
B. A.S.
C. B.S.
D. Ph.D.
Teaching Tip: Help students see possible careers in biotech using Teachers’ Domain videos.

Karmella Haynes a synthetic biologist who is using biotechnology to create living "devices" that help visualize how cancer develops.

http://www.teachersdomain.org/resource/biot09.biotech.car.karmella/
Resource: Synthetic Biologist Karmella Haynes

Media Type: QuickTime Video
Length: 2m 38s
Size: 6.5 MB

This video produced for Teachers' Domain profiles Karmella Haynes, a post-doctoral researcher working in the emerging field of synthetic biology. Karmella explains how she uses biotechnology to build living machines or devices, from genes. She then puts these devices into cells of living things to study the results. Haynes hopes that one day the devices she's working on will carry out complicated functions in human bodies, such as curing a disease. The video demonstrates how Karmella is using synthetic biology to detect cancer cells before they spread.

Background Essay

Synthetic biology is the science of taking different parts from nature—specifically, DNA and protein—and putting them together in new and useful ways. Much like engineers build industrial equipment from machine parts, synthetic biologists build living devices from biological parts. These “devices” are made through modifying pieces of DNA—splicing genes together with...

Related Resources:

- Associate Scientist Andres Berrio (QuickTime Video)
- Careers In Biotechnology (Flash Interactive)
Let’s pause for questions from the audience....
Let’s find out more about your interests in Biotechnology....
I teach…(stamp all that apply)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Middle School</th>
<th>High School</th>
<th>Higher Ed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
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<td>Life Science</td>
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<td>Chemistry</td>
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<td>Physical Science</td>
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<td>Anatomy</td>
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<td>Earth Science</td>
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<tr>
<td>Biotechnology</td>
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What methods do you use to integrate media into your lessons?

<table>
<thead>
<tr>
<th>Method</th>
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</thead>
<tbody>
<tr>
<td>KWL method</td>
</tr>
<tr>
<td>I use repetition</td>
</tr>
<tr>
<td>I pause during key moments to explain</td>
</tr>
<tr>
<td>I use discussion questions for assessment</td>
</tr>
<tr>
<td>I don’t use a lot of media in my science class</td>
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</tbody>
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http://nsdl.org
What is Teachers’ Domain?

• Free online media resources from public television and other trusted sources

• Professional development
  Science courses feature the resources in the collections

http://nsdl.org
Teachers’ Domain Editions

- K-12
- Massachusetts Teachers’ Domain
- VITAL NY
- College Edition (Science)

http://nsdl.org
How do I Sign Up?  www.teachersdomain.org
Finding the Biotechnology Collection

http://nsdl.org
**BIOTECHNOLOGY**

Biotechnology is a rapidly growing field that uses research tools from biology and chemistry to find solutions to current scientific problems. Some biotechnology professionals look for the genetic basis of disease or factors that affect lifespan. Others focus on solving food shortages, the climate crisis, or criminal investigations.

These resources explore common laboratory techniques used for treating disease and improving diagnosis, and examine the ethical debate over such research. Career profiles demonstrate the multifaceted nature of biotechnology jobs and the wide range of opportunities in this field.

- **Applications**
- **Careers**
- **Concepts**
- **Tools and Techniques**

[www.teachersdomain.org/special/biot/](http://www.teachersdomain.org/special/biot/)
Let’s pause for questions from the audience....
How can you integrate the Media Collection into the classroom?

• Example 1: Applications
• INTERACTIVE: Gene Cloning
• This interactive activity details the steps involved in producing clones of genes that can then be used to transform the characteristics of an organism.

http://nsdl.org
Example 2: Career Exploration

INTERACTIVE: Careers in Biotechnology

This interactive serves as an overview to a wide variety of biotechnology related careers.

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Example 3: Concepts

- VIDEO: Engineering Biofuels
- This video profiles the work of a biologist experimenting with ways to produce a cleaner-burning fuel from biological matter, using genetically modified microorganisms.

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Example 4: Tools and Techniques

VIDEO: Agarose Gel Demos

- Watch a "how-to" video on the proper technique of preparing an agarose gel for use in gel electrophoresis
What are the challenges to bringing biotechnology into the classroom? Stamp all that apply

<table>
<thead>
<tr>
<th>Content knowledge</th>
<th>Biotechnology isn’t in my state standards</th>
<th>Lack of time in my curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of equipment</td>
<td>Lack of school/admin support</td>
<td>Lack of funds</td>
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Resources

• WGBH Teachers’ Domain 😊
• DNA Interactive: http://www.dnai.org/
• Dolan DNA Learning Center http://www.dnalc.org/
• Bio-Link
  – http://www.bio-link.org/newslist.htm
• Biotechnology Industry organization
  – http://www.bio.org/speeches/pubs/er/
• Edvotek, Bio-Rad, Carolina Biological
• State initiatives
• Your local community college or university
• Local industry
Let’s pause for questions from the audience....
Spring 2010 Biotechnology PD Opportunities from WGBH Teachers’ Domain

Interested in participating? Email Daniella_Quinones@wgbh.org
Teaching Biotechnology Online Course
Available Summer 2010
http://pbsteacherline.org

- PBS Teacherline
- 30 hours, grad credit
- Integrates digital media
- Builds upon lesson plan

http://nsdl.org
Today’s NSDL Experts

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THANK YOU!
Resources from this web seminar are listed at:
http://www.diigo.com/list/nsdlworkshops/web-seminar-wgbh-biotech

Learn about new tools and resources, discuss issues related to science education, find out about ways to enhance your teaching at:
http://expertvoices.nsdl.org/learningdigitalK12
National Science Teachers Association
Dr. Francis Q. Eberle, Executive Director
Zipporah Miller, Associate Executive Director
Conferences and Programs
Al Byers, Assistant Executive Director e-Learning

NSTA Web Seminars
Paul Tingler, Director
Jeff Layman, Technical Coordinator