



Electronic Teacher Guide

Supporting Curriculum Implementation
and Change in Teaching Practice

EDC Learning
transforms
lives.

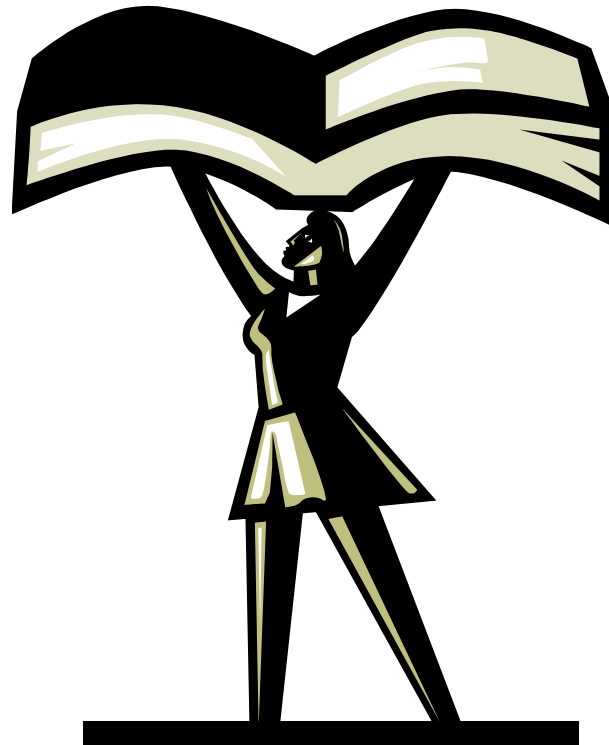
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The Initial Challenge



How to Make the Teacher Guide for *Foundation Science* More Accessible

Print Teacher Guides



Expected Change in Teaching Practice



- Enacted curriculum reflects the intentions of the curriculum developers
- Mindful modification of the curriculum to meet student and teacher needs
- Change in teaching practice over time

Four Features That Contribute to Teacher Learning



1. Aligns with the curriculum
2. Operationalizes teacher tasks for planning, teaching, and reflecting with interactive web tools
3. Supports changing teaching practice with a range of tools
4. Provides pathways for change over time; individual, self-paced, varied entry points

Supports for Implementation and Changing Practice



- Descriptions of Purpose and Rationale
- Teaching strategies
- Science Background
- Facilitating Activities
- Facilitating Discussions
- Formative Assessments
- Activation of Prior Knowledge
- Content Sequencing

Electronic Teacher Guide Website (eTG)

The screenshot displays the Electronic Teacher Guide (eTG) website interface. The browser window shows the URL `v2dev.foundationscience.org/reader.php`. The page title is "Foundation Science **biology** eTeacher Guide". The main heading is "Learning Experience 3 Of Proteins and Traits: Exploring the Molecular Basis of Traits".

The interface includes a navigation bar with icons for "LE Preview", "Introduction", "Consider", "Investigate", "Process", "Assess & Enrich", "Book View", "Text Size", and "Search Web". Below this is a "My Lesson Planner: LE3" section with options for "workspace", "New", "Presentations", "List View", "Preview", "Save", and "Export".

The main content area is titled "Introduction: Introduction (4)" and features a "Big Idea" slide. The slide content is as follows:

Big Idea:
Proteins encoded by DNA are responsible for traits

DNA → **Protein** → Trait

PURPOSE: The purpose of this slide is to introduce the Big Idea. The drawing informs students of what they're going to be looking at more closely in this LE. [Put this language into the first LE 2 slide]

CLARIFY: Explain to students that they will explore the biochemical basis of traits and the relationship among DNA, genes, proteins, and traits by looking at genetically modified organisms.

REVIEW: You may wish to connect this big idea relates to what students have already studied:

- DNA as the biomolecule responsible for traits
- the cellular processes involved in the translation of the information encoded in DNA into proteins

At the bottom of the slide, it says "The Big Question:".

On the left side of the slide, there is an "Overview" section with the following text:

In this learning experience, students consider transgenic plants as an approach to understanding the biochemical basis of traits. Transgenic plants and animals (that is, plants and animals expressing genes from other organisms) are being developed to generate products such as silk, insulin, growth hormone, and blood clotting factor IX, and to improve the production and nutritive value of crops such as corn, potatoes, rice, and soy by making them resistant to pests and herbicides and by incorporating genes that make more starch and protein. Using the concept of transgenic organisms as a context can help students understand the relationship among genes, proteins, and traits, a relationship students often having difficulty understanding. It will also enable them to begin to consider the pros and cons of these genetically modified organisms (GMOs).

Three Special Features of the eTG

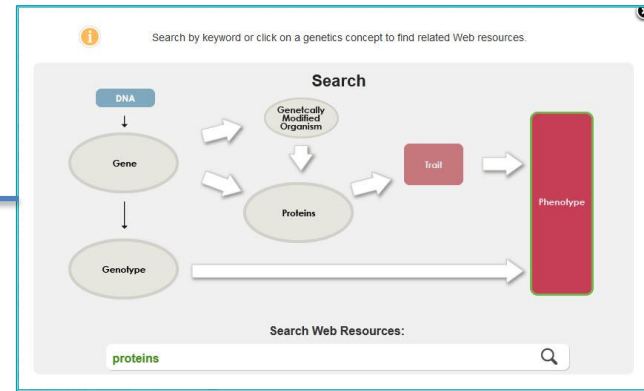
Teaching Sequence Preview Learning Experience 3
Of Traits and Proteins: Exploring the Molecular Basis of Traits
 Suggested time for this learning experience: 9 sessions

Consider **Investigate**

Session 1 **Sessions 2, 3, 4, and 5**

<p>Brainstorming</p> <p>Pair-Share Class Discussion Students brainstorm about genes, traits, and what they know about genetically modified organisms.</p>	<p>What's the Story: One Potato, Two Potatoes</p> <p>Reading: Suggested Homework Students read about genetically modified potatoes.</p>	<p>Challenge</p> <p>Framing Question Students are challenged to decide whether genetically modified potatoes should be used to make French fries in the school cafeteria. Students will complete this challenge at the end of the Investigate section.</p>
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Teaching Sequence Preview
[Play Screencast](#)



Semantic Web

Foundation Science **biology** eTeacher Guide

Learning Experience 3 Of Proteins and Traits: Exploring the Molecular Basis of Traits

LE Overview Introduction Consider Investigate Process Assess & Extend Book View Test Size Search Help

Overview

In this learning experience, students consider transgenic plants as an approach to understanding the biochemical basis of traits. Transgenic plants and animals (that is, plants and animals expressing genes from other organisms) are being developed to generate products such as silk, insulin, growth hormone, and blood clotting factor IX, and to improve the production and nutritive value of crops such as corn, potatoes, rice, and soy by making them resistant to pests and herbicides and by incorporating genes that make more starch and protein. Using the concept of transgenic organisms as a context can help students understand the relationship among genes, proteins, and traits, a relationship students often having difficulty understanding. It will also enable them to begin to consider the pros and cons of these genetically modified organisms (GMOs).

Big Idea:
 Proteins encoded by DNA are responsible for traits

DNA → Protein → Trait

PURPOSE: The purpose of this slide is to introduce the Big Idea. The drawing informs students of what they're going to be looking at more closely in this LE. (Put this language into the first LE 2 slide.)

CLAIMS: Explain to students that they will explore the biochemical basis of traits and the relationship among DNA, genes, proteins, and traits by looking at genetically modified organisms.

REVIEW: You may wish to connect this big idea relates to what students have already studied:

- DNA as the biomolecule responsible for traits
- The cellular processes involved in the translation of the information encoded in DNA into proteins

The Big Question:
 What is the relationship among genes, proteins, and traits of an organism?

The smaller questions:
 1. How does the expression of a gene result in the traits of an organism?

My Lesson Planner: LE3

Challenge (1) Investigate: Activity (8)

INVESTIGATE: OVERVIEW

To gather the information you need to make your decision, you will need to understand how genes are responsible for traits of an organism. To achieve this understanding you will:

- Investigate how genes can be inserted into bacteria to give them a new trait
- Explore how transgenic plants are made
- Research the current thinking on the advantages and disadvantages of transgenic plants

PURPOSE: This activity is a direct demonstration of the relationship between genes and traits, and should help students recognize the connection.

FACILITATE: You have elected to carry out this activity as a demonstration or to provide students with the data to analyze, take this time to walk students through the procedure so that they understand the experiment and the importance of controls. Students should also respond to the Analysis questions.

Introducing a New Trait into E. coli

You will carry out 3 steps involved in inserting a new gene into a bacterial cell:

- Mix the DNA containing the "glow" gene and a gene for antibiotic resistance with the bacteria
- Heat the bacteria to help them take the DNA inside
- Place the bacteria on agar containing nutrients, with or without an antibiotic

FACILITATE:

- Begin by discussing the idea of the ability to "glow" as a trait
- Are you familiar with any organisms that glow?

Lesson Planner

Supports for Changing Practice Pathways



Discussion Supports

- Discussion questions
- Chart describing productive talk moves (TERC)
- Videos modeling brainstorming and take a position discussions
- Essay on how science talk supports learning
- Vignettes

How Can Technology Help?

- Merges content of teacher guide and student book in a comprehensive eReader
- Enables mindful modification of curriculum with fidelity to intentions of curriculum developers
- Allows selection of content as needed
- Operationalizes teacher tasks with interactive web tools
- Supports change in practice over time at individual pace

What Challenges Does Technology Pose?



Double Innovation

Inquiry and Technology

Challenge for Professional Development Regardless of Mode



How do we promote that the goals of professional development work have an impact in the classroom?