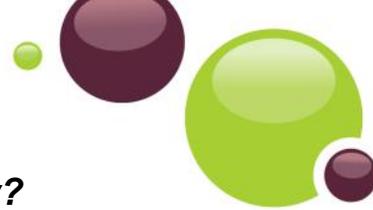


Are the fish we buy labelled correctly?



OVERVIEW

Suggested Timing: 90 minutes or 2 periods (not including optional lessons)

Subject Focus:
 Science, Biology

21st Century Skills Focus: Critical Thinking, Communication, Collaboration

Context

Food is an extremely important part of our lives, and more and more people are concerned about where their food comes from and what goes into their food. Food is also becoming more and more expensive, so consumers want to know if they are getting what they pay for. Even if you carefully read the package, you may not be getting what you think. DNA barcoding is one tool that scientists can use to confirm or refute the identity of food such as beef, fish and other seafood.

Learning Goals

- Develop awareness of applications of DNA Barcoding
- Understand the processes used to extract DNA from cells and to sequence DNA
- Understand how DNA sequences can be used to identify species
- Correctly and accurately follow a scientific protocol and keep accurate and complete records
- Become familiar with the seafood supply chain from point of origin to consumer

Learning Activities

Students will explore the issue of market substitution for seafood by reading articles, collecting fish samples for DNA barcoding and discussing the impacts and implications of market substitutions.

Big Idea

DNA barcoding is a tool which allows scientists to determine the species of a living thing based on a small segment of DNA. Applications of DNA barcoding include detecting food fraud, such as that which is occurring in the seafood industry.

MINDS-ON 1: The Fish Hook - Introduction to the Market Survey

Suggested Timing: 30 minutes

In this introductory activity, students will read two articles about the issue of fish mislabelling and complete two graphic organizers to identify the issue, the implications of the issue and possible solutions. They will complete the organizers individually and in pairs, and then discuss the results with the whole class.

NOTE: The other MINDS-ON activities below are OPTIONAL.

Teacher Resources

MINDS-ON 1: The Fish Hook (Lesson Plan) [[.pdf](#)]

Student Resources

BLM M1: Fish Mislabelling Graphic Organizer [[.doc](#)] [[.pdf](#)]

BLM M2: Comparing Sources Graphic Organizer [[.doc](#)] [[.pdf](#)]

Article #1: Vancouver Sun Article [[.pdf](#)]

Article #2: CBC News article [[.pdf](#)]

OPTIONAL ACTIVITIES

MINDS-ON 2: DNA Barcoding 101

Suggested Timing: 40 minutes

Students will be introduced to the topic of DNA barcoding by viewing a DNA Barcoding PowerPoint presentation and answering questions based on the presentation.

Teacher Resources

MINDS-ON 2: DNA Barcoding 101 (Lesson Plan) [[.pdf](#)]

DNA Barcoding 101 [[.ppt](#)]

DNA Barcoding 101 - Answer Page [[.pdf](#)]

Student Resources

BLM M3: DNA Barcoding 101 Assignment [[.doc](#)] [[.pdf](#)]

MINDS-ON 3: Banana DNA Extraction

Suggested Timing: 30 minutes

In this hands-on lab, students will extract DNA from bananas in order to gain a basic understanding of how DNA can be extracted from tissues and cells.

Teacher Resources

MINDS-ON 3: Banana DNA Extraction (Lesson Plan) [[.pdf](#)]

Banana DNA Extraction - Answer Page [[.pdf](#)]

Student Resources

BLM M4: Banana DNA Extraction [[.doc](#)] [[.pdf](#)]

Backgrounder: DNA Extraction [[.pdf](#)]

MINDS-ON 4: DNA Sequencing

Suggested Timing: 30 minutes

In this hands-on/minds-on activity, students will learn about Sanger sequencing by creating a paper-based model of the process.

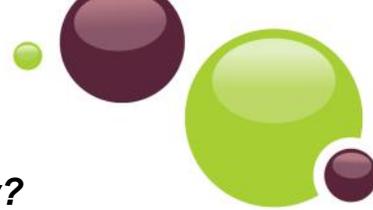
Teacher Resources

MINDS-ON 4: DNA Sequencing (Lesson Plan) [[.pdf](#)]

DNA Sequencing - Answer Page [[.pdf](#)]

Student Resources

BLM M5: DNA Sequencing [[.pdf](#)]



Are the fish we buy labelled correctly?

ACTION: Fish Market Survey Data Collection

Suggested Timing: 20 minutes plus time outside of class

This is the core activity for the *Fish Market Survey* project. Students will collect samples of fish from local grocery stores or fish markets and then prepare the samples for shipment to the Centre for Biodiversity Genomics in Guelph, Ontario. **Requires use of Apple device with GPS**

Teacher Resources

ACTION: Data Collection (Lesson Plan) [\[.pdf\]](#)

Letter to Parents/Guardians [\[.doc\]](#) [\[.pdf\]](#)

Fish Sampling Protocol [\[.ppt\]](#) [\[.pdf\]](#)

Fish Market Survey Class Sampling

Plan [\[.doc\]](#) [\[.pdf\]](#)

Student Resources

BLM A1: Student Sample Collection Checklist [\[.doc\]](#) [\[.pdf\]](#)

LifeScanner (video on CurioCity) [\[.html\]](#)

CONSOLIDATION 1: Fish Market Survey Results

Suggested Timing: 40 minutes

Students will find out about the DNA sequences (barcodes) for the fish samples collected in this project and whether or not they were labelled correctly. As a class they will watch a presentation from the Centre for Biodiversity Genomics which will highlight interesting findings from the project as a whole.

Teacher Resources

CONSOLIDATION 1: Fish Market Survey Results (Lesson Plan) [\[.pdf\]](#)

Fish Market Survey Class Sampling

Plan (from Action)

Market Survey Results Presentation

[\[.pptx\]](#) [\[.pdf\]](#) [YouTube video will be available January 2017]

OPTIONAL ACTIVITY

CONSOLIDATION 2: Exploring the Impacts

Suggested Timing: 50 minutes

In this final set of activities, students will learn about the seafood supply chain and use the White Hat - Black Hat strategy to consider ways of minimizing fish mislabelling.

Teacher Resources

CONSOLIDATION 2: Exploring the Impacts (Lesson Plan) [\[.pdf\]](#)

Seafood Supply Chain Activity - Answer Page [\[.pdf\]](#)

Student Resources

BLM C1: Seafood Supply Chain Activity [\[.doc\]](#) [\[.pdf\]](#)