Introduction

Overview
1. Authentic research to drive interest in STEM (Science, Technology, Engineering, and Mathematics)
2. Curriculum
3. DNA barcoding
4. Case studies
5. Future directions or The Rise of Ubiquitous Genomics

Authentic research to drive interest in STEM

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Curriculum

Goals

1. **Experimental Design**
   - Develop a research plan to investigate biological diversity of a local environment

2. **Data Collection/Analysis**
   - Apply appropriate techniques for data collection in the field and in the laboratory

3. **Research Literacy**
   - Locate and read printed and online articles from the professional scientific literature

4. **Sharing Results**
   - Write, present, and publicly defend a research project through science fairs or other science competitions

5. **Relevance and Impact of Research**
   - If possible, share results with broader scientific community, deposit DNA sequences, submit organism occurrence data

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**DNA Barcoding**

A short, standardized fragment of DNA used for identifying species
Case Studies
NYC – High School for Environmental Studies
1. Science Research Course
2. Built DNA lab
3. Students pursue independent research from 10th-12th grade

Case Studies
NYC – High School for Environmental Studies

Case Studies
BioBelize – The Biodiversity Center of Belize
1. Introduce mobile DNA lab, lightweight, no refrigeration
2. Shorter multi-day workshop model

Case Studies
BioBelize – The Biodiversity Center of Belize
1. Insect species identification – Belizean high school students
2. Diet analysis – Gut contents, species identification – Junior college students

Case Studies
PeerJ
The United States dried seahorse trade: a comparison of traditional Chinese medicine and economics-curricula markets using molecular identification
J.T. Boden, Eric Swan, Stephen Harris*, Kettyta Edinor, Ibrahail Akel, Mancis Foster, Susan Peltz*, Michael J. Hickerson*, George Amato, Rob DesJardins* and John Waters*
Case Studies
BioBelize – The Biodiversity Center of Belize
1. Belize Zoo – sexing and species identification – Zoo staff and masters students

The Ross School – Long Island NY
1. Species Identification from Solomon Islands – High school students

Batcode - Indonesia

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Ubiquitous Genomics
Self contained, inexpensive, mobile DNA lab
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