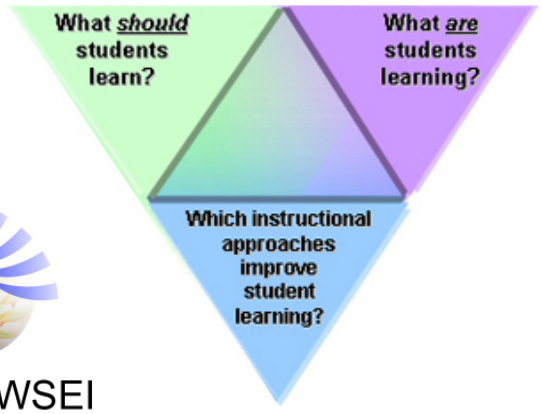
# Update from the Carl Wieman Science Education Initiative

LS CWSEI

# An approach to improving university education




LS CWSEI

# The LS-CWSEI team

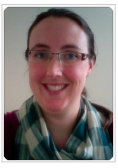
Dr. Malin Hansen

Dr. Bridgette Clarkston


Dr. Lisa McDonnell

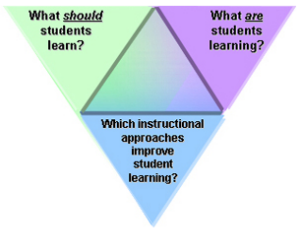
Dr. Laura Weir

Dr. Mandy Banet



Dr. Megan Barker

# The roles of an STLF


1. **Help identify and implement best practices for teaching in Biology courses at UBC**
2. **Perform pedagogical research to obtain data to support evidence-based teaching practices**

# Implementing best practices

**BIOL 230**
**Dr. Malin Hansen**

**BIOL 336**
**Dr. Bridgette Clarkston**

**BIOL 234**
**Dr. Lisa McDonnell**

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**BIOL 204, 209**
**Dr. Laura Weir**

**BIOL 260, 361**
**Dr. Mandy Banet**

**BIOL 112, 200, 201**
**Dr. Megan Barker**

# Implementing best practices

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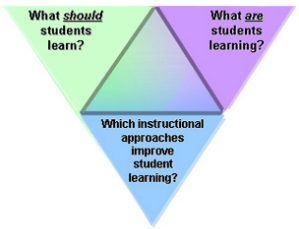
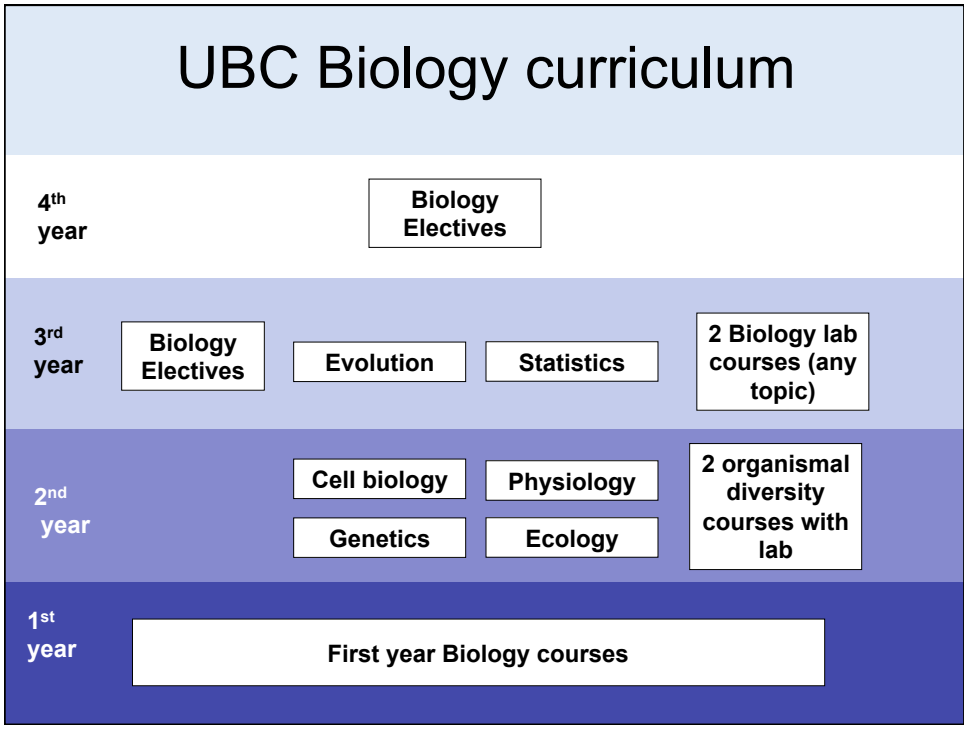
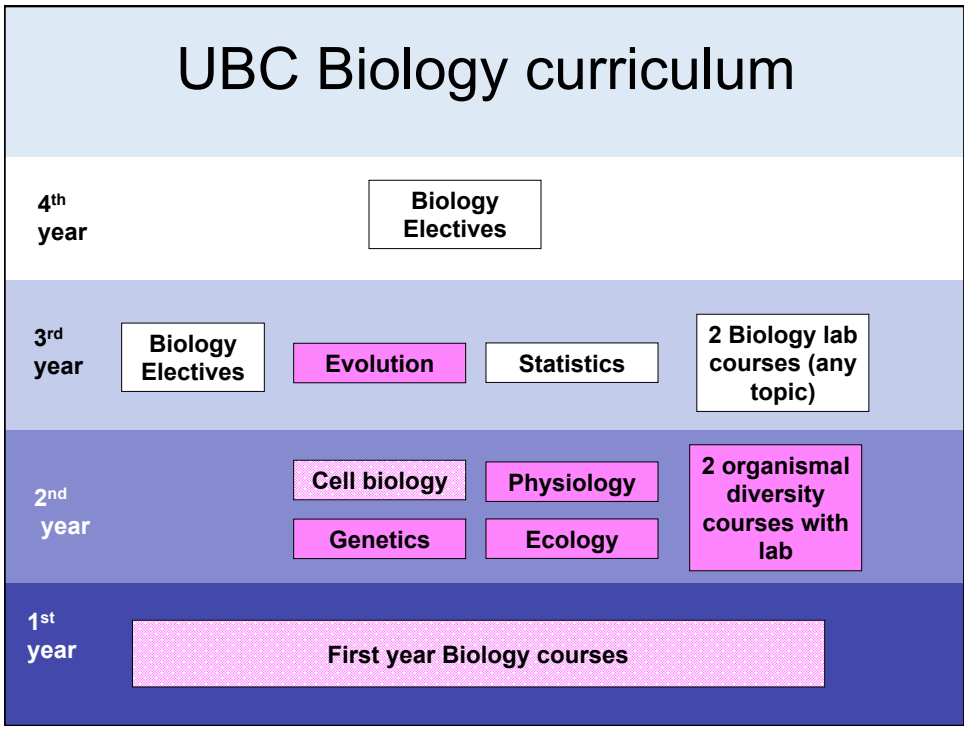



1. **Learning objectives**
2. **Pre-reading assignments**
3. **Clicker questions**
4. **Worksheets**
5. **Tutorial activities**


UBC Biology curriculum
4th year
Biology Electives
3rd year
Biology Electives
Evolution
Statistics
2 Biology lab courses (any topic)
2nd year
Cell biology
Physiology
Genetics
Ecology
2 organismal diversity courses with lab
1st year
First year Biology courses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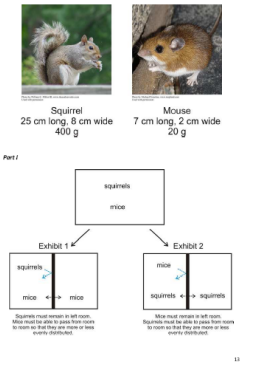
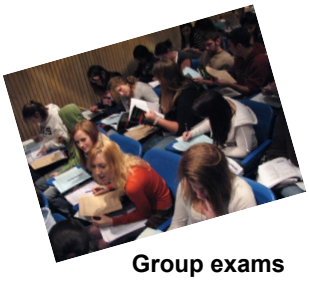
# Fostering active learning in lecture


Clicker questions

Pre-readings




Invention activities



Group exams

Staged worksheets and in-class problems

# The roles of an STLF

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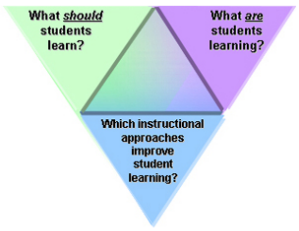


1. **Help identify and implement best practices for teaching in Biology courses at UBC**
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## Malin Hansen

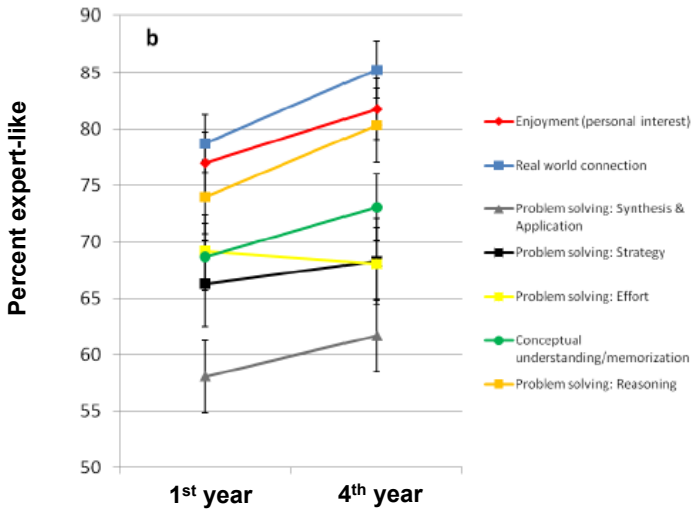
1. **Concept inventory for population dynamics**
2. **How to use analogies for effective learning**
3. **Changes in student attitudes to biology across the program**

## Student attitudes survey

- Survey administered to Biology students in 1st and 4th year
- Do students respond as would an "expert" biologist?

| | |
|---|---|
| **Sample Survey Questions:** | • **Knowledge in biology consists of many disconnected topics**<br>• **Reasoning skills used to understand biology can be helpful to my everyday life.**<br>• **To learn biology, I only need to memorize facts and definitions**<br>• **Mathematical skills are important for understanding biology** |

# Student attitudes survey




# Bridgette Clarkston

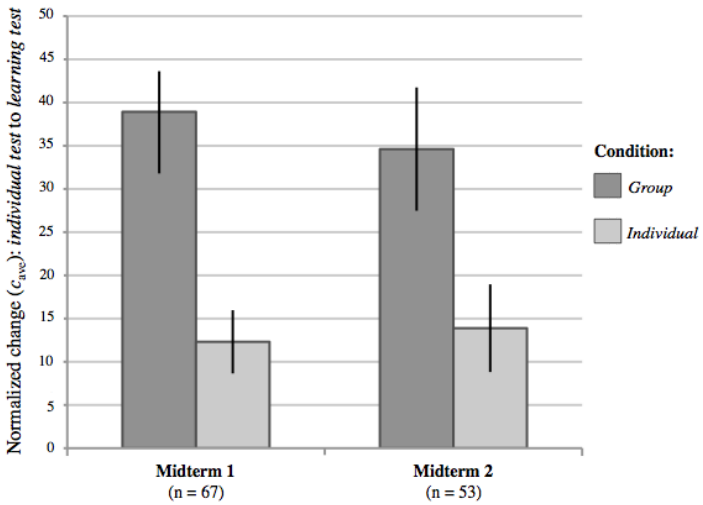
- Identifying common misconceptions in genetics (comparison of UBC students vs. students in a MOOC)
- Confronting teleological thinking in evolutionary biology
- Utility of group exams

# 2-stage (group) exams

- Students complete an exam individually and hand in
- Get together in groups of four and work on the same exam
- Hand in
- Mark is a combination of individual score (75%) and group score (25%)

"The group exams give you a chance to go over your answers to the exam while you still care about the questions."

# Result: Greater learning gains when students tested in groups



## Lisa McDonnell

- Misconceptions in genetics (and comparison of UBC students vs. students in a MOOC)
- Retention of conceptual knowledge vs. procedural skills in genetics
- Characteristics of expert vs. novice problem solving behavior in genetics

## Laura Weir

- Characterizing student challenges with constructing logical arguments in Biology
- Efficacy of interventions targeting study skills
- Integrating treatment of phylogenetics concepts across cources

# Mandy Banet

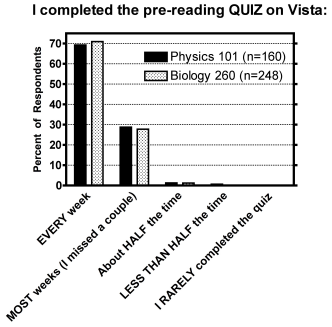
- Utility of targeted pre-reading assignments
- Characterizing student challenges with constructing logical arguments in Biology

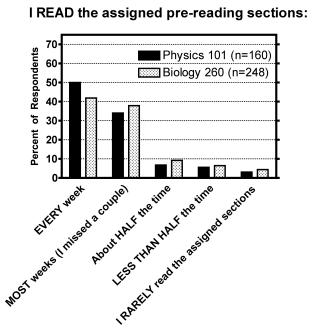
# Pre-reading

- **Most students do not prepare by reading the textbook before coming to class**
- **Active learning strategies work best when students are prepared and already familiar with the basics of the material**
- **How can we get students to read before coming to class?**

**•Use a targeted approach**

# Student survey data: pre-readings




98% of the students report taking the quiz on a regular basis

82% of the students report reading the textbook on a regular basis

# Student motivation for pre-reading

When you did the pre-reading assignments, what MOTIVATED you to do so?

*"I learn better in class if I have previous knowledge of the topic. I find that I pay more attention and my brain can make more connections and build on previous knowledge."*

*"It's for marks and ... it helps me to distinguish what I know and what I have troubles with so I can be all ears in the parts where I am struggling with in class."*

*"...so if I have any questions, they would be knowledgeable and well-founded questions."*

# Megan Barker

- Effectiveness of “flipped classroom” and “blended learning” strategies

# Group project – curriculum mapping

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Dr. Mandy Banet

Dr. Megan Barker