

**Content first,  
jargon second:**

**An assessment of the  
influence of technical  
vocabulary on  
conceptual learning**

Megan Barker, Lisa McDonnell, & Carl Wieman

# Rationale/background

- To achieve fluency in a scientific discipline, students must learn the discipline-specific concepts as well as the technical vocabulary that represents them.
- However, if the concepts and vocabulary are taught in synchrony, as is traditionally the case, the cognitive load may be overwhelming, impacting student learning of the concepts<sup>1</sup>.

# Research Questions:

- Can we increase student learning of concepts and technical vocabulary by teaching them separately rather than together?
- How will student learning be affected if we teach the concepts in plain language first, before teaching jargon?

# Study design: Treatment/control

	<b>Content-first (Treatment) sections:</b>	<b>Control sections:</b>
<b>Pre-class reading &amp; quiz</b>	Jargon-free	Normal (jargon)
<b>Start of class</b>	Introduced to vocabulary	Content-related material
<b>During class</b>	Worksheet, mini-lecture, clickers, worksheet	
<b>Last part of class</b>	Post-test	

Topic: Genomes and DNA structure  
within Biology 112 course, 4 sections

# Data Collected:

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Data about the student populations in each section:

Concept inventory  
pre-test scores

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Prior to class:

Pre-reading quiz online

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Determining our cohort of participants:

Clicker question in class asking who did pre-reading

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Learning assessment:

Post-test (4 multiple choice questions, 2 open response)

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Student opinions on jargon:

Survey posted online

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# Analysis Strategy:

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Analyze data for students who completed the pre-reading

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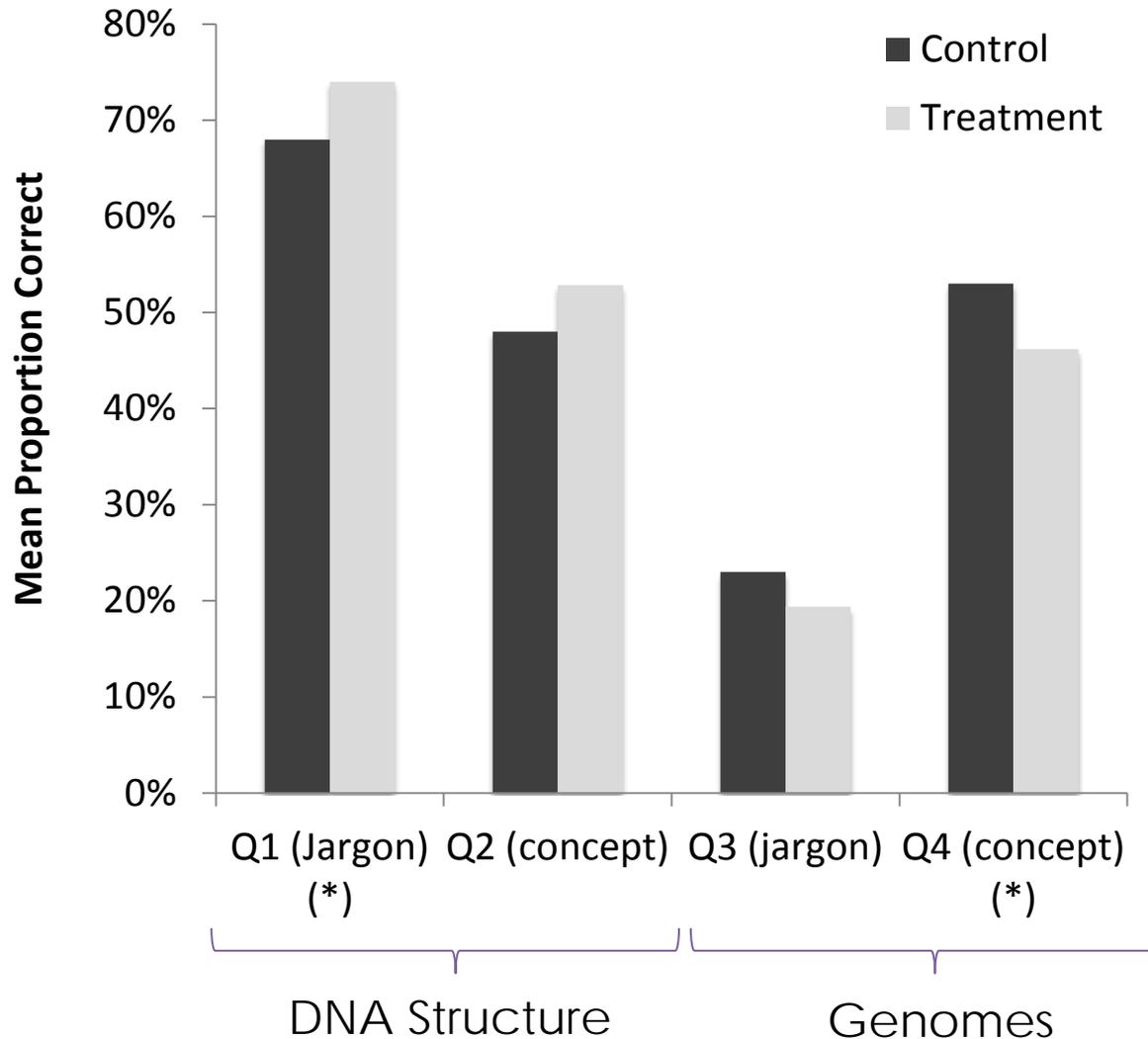
Blind-code open response questions for presence and correctness of concepts, jargon (Iterative process to develop coding scheme)

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Compare post-test scores between treatment and control groups

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# Results: Multiple choice questions



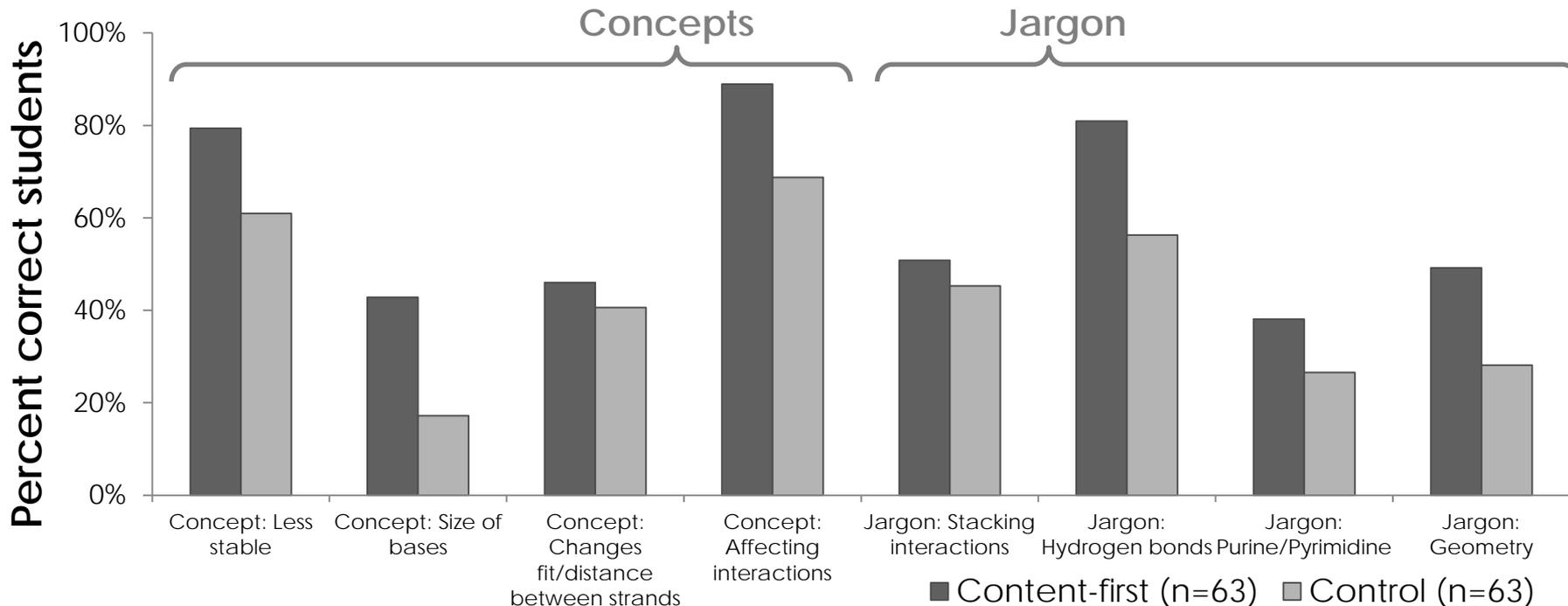
- The content-first approach does not affect students' ability to recognize correct concepts or jargon
- The "genomes" jargon question is not suitable for measuring understanding

# Open-response Question Analysis

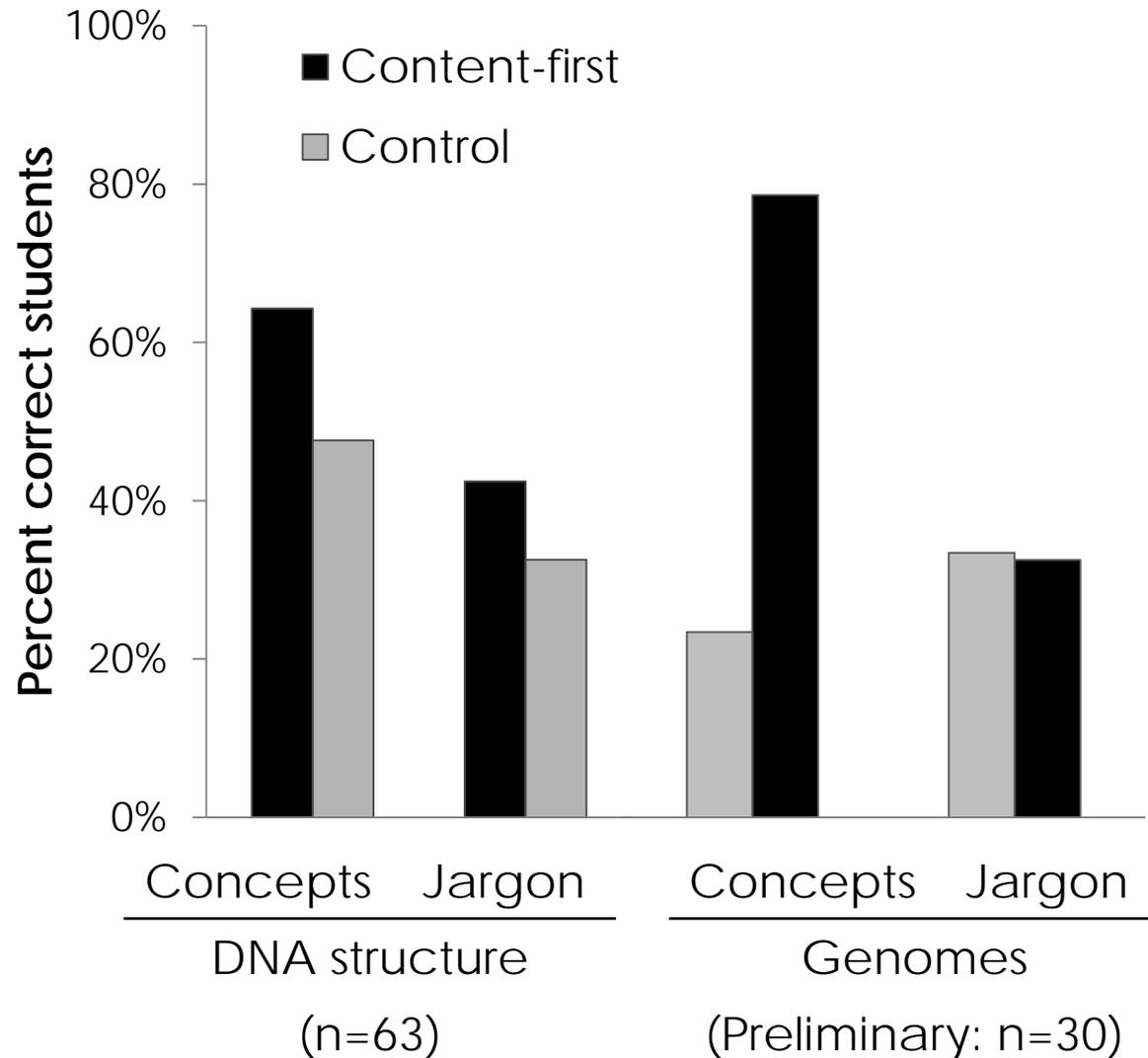
1. Code for presence of correct concept and/or jargon:

Student #	Concept: Less stable	Concept: Size of bases	Concept: Changes distance between strands	Concept: Affects interactions	Jargon: Stacking interactions	Jargon: Hydrogen bonds	Jargon: Purine/Pyrimidine	Jargon: Geometry
12345678	1	0	1	0	1	0	0	0
98765432	1	0	1	1	1	1	0	0
23456789	1	0	0	0	0	1	1	0
<b>Total</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>0</b>
<b>% of students</b>	<b>100%</b>	<b>0%</b>	<b>67%</b>	<b>33%</b>	<b>67%</b>	<b>67%</b>	<b>33%</b>	<b>0%</b>

2. Compare % correct students between sections:



# Content-first sections are better at explaining concepts, and may be better at using jargon



This may fit in with constructivist theory of knowledge: when concepts are understood first, jargon can fit into students' understanding rather than being disconnected.

Possibly a topic-dependent effect?  
(or test questions may need work)

# What do students think about jargon?

- 67% agree that it is challenging to learn a new concept when there is a lot of jargon
- 78% agree that it would be easier to learn a new concept in everyday language

## *Student thoughts:*

*"It would be easier to memorize the jargon when we have a deep understanding of the concept."*

*"Using big words to describe something that could be explained in everyday language does not make the subject more interesting or sophisticated."*

*"Students would be able to understand a concept in an easier fashion and then build upon that learning with the proper term/jargon."*

# Preliminary conclusions...

- The content-first approach does not affect students' ability to recognize correct concepts or jargon
- Content-first approach may improve students' ability to articulate their understanding
  - A similar trend measured on “genomes” topic
  - Would be difficult to notice/measure this in classes with only multiple-choice assessments
- Students feel that learning new concepts without jargon, at first, might help their learning

# Future plans & outstanding questions

- Need to analyze additional datasets
  - Genomes/DNA
  - Immune system
- Possibly collect more data in the fall
  - Re-consider our open-response questions in light of the coding scheme?
  - Revise multiple choice questions and ask about fewer topics, to pull apart correct and incorrect use of jargon
  - Consider different topic(s)?
- How to determine if jargon is a barrier?
  - Are there particular topics where jargon is more of a barrier than others? How to identify these as an instructor?

# Questions we would like feedback on!

- Limitations, concerns we should address in a (final) iteration of the study in the fall?
- Statistical significance: How to perform analysis of this type of data?
- Tips/ideas for developing rubric for coding student responses?
- Tips on how to identify topics where the jargon is a barrier?
- Experimental design and class time: ideas for other ways to investigate this, given the time constraints?

# Acknowledgements

- Thanks to the Biology 112 instructors who supported us in this study!  
Sunita Chowrira, Carl Douglas,  
Ehleen Hinze, Karen Smith
- Thanks to Laura Weir for discussions on study design and statistical analysis
- Reference  
<sup>1</sup> Brown, B. A., & Ryoo, K. (2008). Teaching Science as a Language : A " Content-First " Approach to Science Teaching, Journal of Research in Science Teaching, 45(5), 529–553.