

**Content first,
jargon second:**

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

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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 concepts¹.

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

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

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

Data Collected:

Data about the student populations in each section:

Concept inventory
pre-test scores

Prior to class:

Pre-reading quiz online

Determining our cohort of participants:

Clicker question in class asking who did pre-reading

Learning assessment:

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

Student opinions on jargon:

Survey posted online

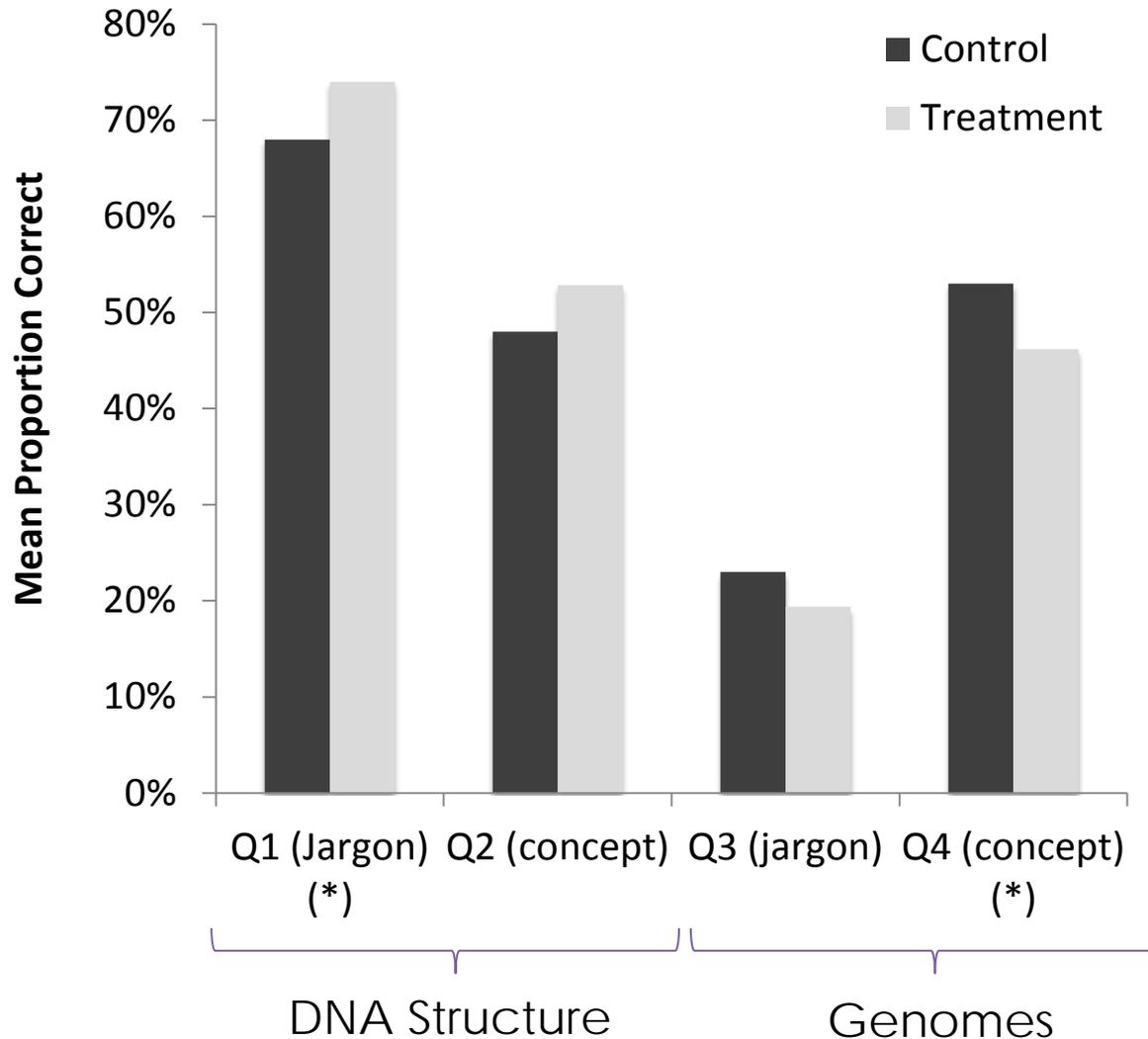
Analysis Strategy:

Analyze data for students who completed the pre-reading

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

Compare post-test scores between treatment and control groups

Results: Multiple choice questions



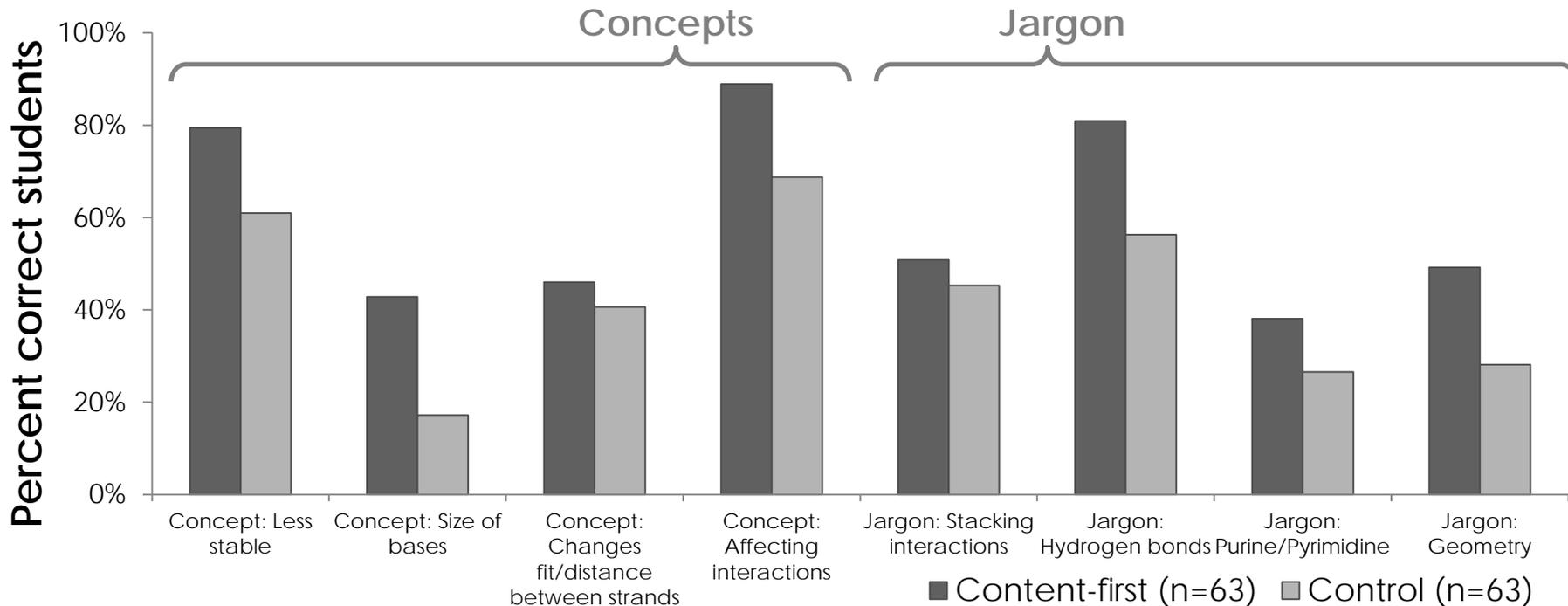
- The content-first approach does not affect students' ability to recognize correct concepts or jargon
- The "genomes" jargon question is not suitable for measuring understanding

Open-response Question Analysis

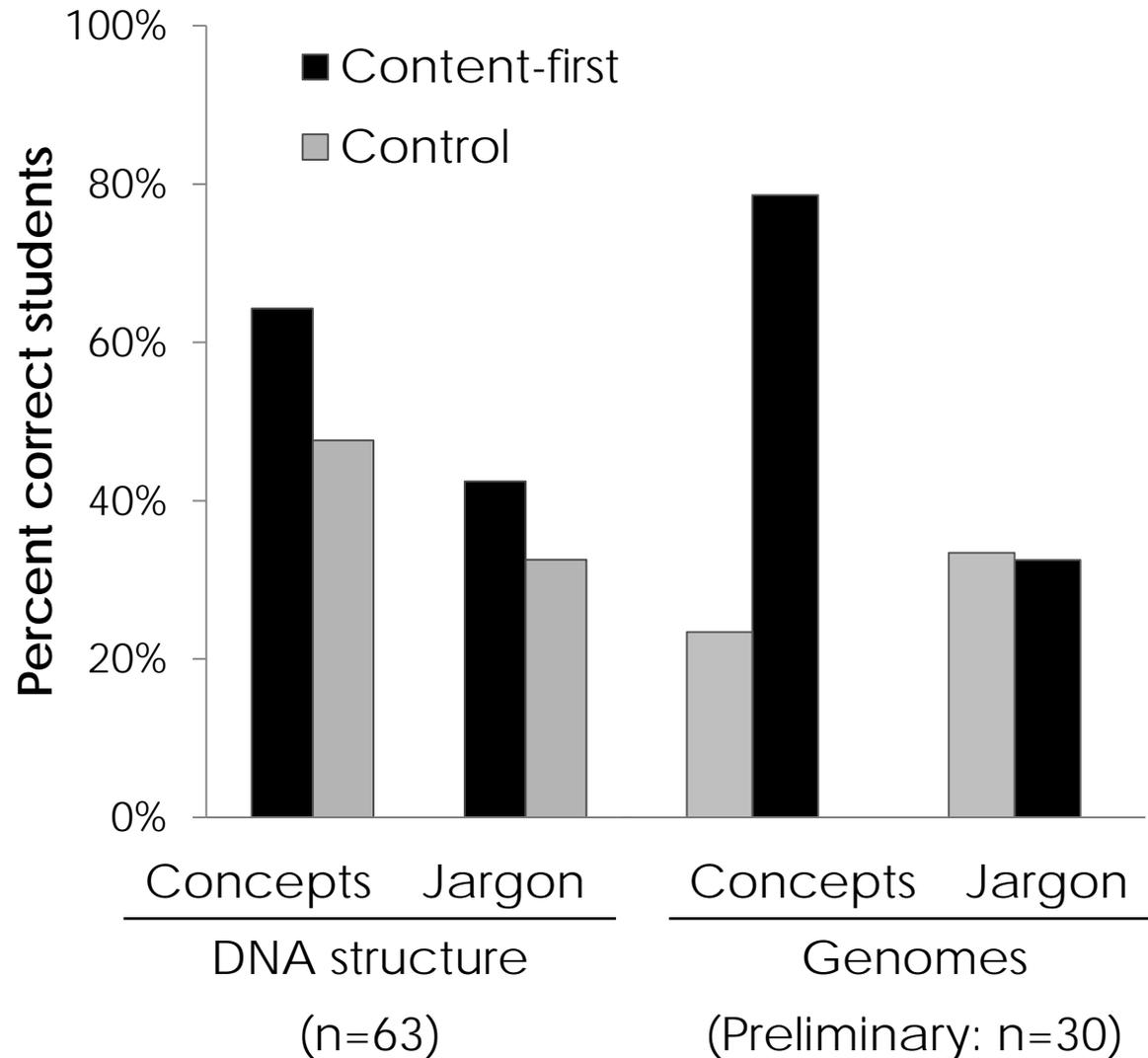
1. Code for presence of correct concept and/or jargon:

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
Total	3	0	2	1	2	2	1	0
% of students	100%	0%	67%	33%	67%	67%	33%	0%

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
¹ 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.