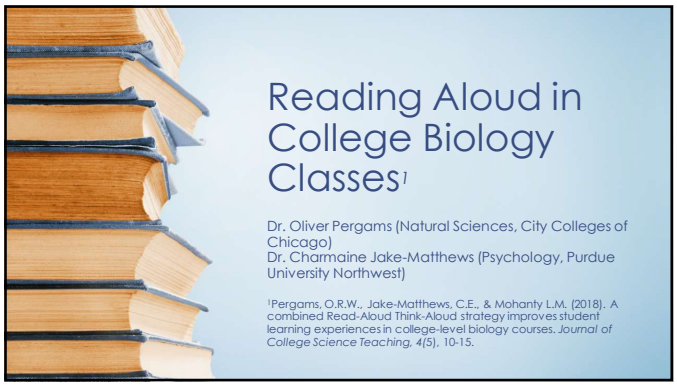


Reading Aloud in College Biology Classes[1]

Dr. Oliver Pergams (Natural Sciences, City Colleges of Chicago)
Dr. Charmaine Jake-Matthews (Psychology, Purdue University Northwest)

[1]Pergams, O.R.W., Jake-Matthews, C.E., & Mohanty L.M. (2018). A combined Read-Aloud Think-Aloud strategy improves student learning experiences in college-level biology courses. *Journal of College Science Teaching, 4(5),* 10-15.

1

What do students hate to do the most?

2

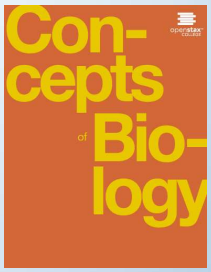
READING!!!

- They will do almost anything to avoid it.
- Don't really know why this is. Common speculation:
  - Reduced attention span (perhaps as a result of videophilia)
  - Poor preparation in earlier education
  - Laziness
  - In STEM disciplines, some scientific jargon is simply hard to read for anyone
- Reading comprehension has of course a huge, possibly primary impact on students' comprehension and their success in school and life.

3

Other factors that led me to try this experiment: Free Textbook

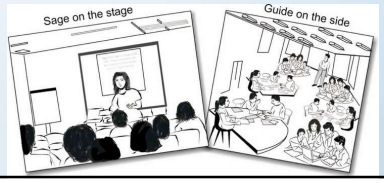
- I had decided to use a free text
  - Developed by Rice University
  - Funded by several major philanthropic foundations
- However, the book made little attempt to reduce scientific jargon or simplify language, and was fairly densely written.



4

Other factors that led me to try this experiment: "Sage on the Stage"

- I was tired of the standard "sage on the stage" format of a professor lecturing using PowerPoint
  - Thought students might be a little tired as well!
- Also, when I began the 1st class no prepared slide presentations were offered by the publisher



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Theoretical Support for the Read Aloud-Think Aloud Approach

- Vygotsky's Developmental Theory
  - Zone of Proximal Development
  - Scaffolding

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Theoretical Support for the Read Aloud-Think Aloud Approach

- Goals of Scaffolding in Science Education[2]
  - Content understanding
  - Procedural skills
  - Metacognition

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Theoretical Support for the Read Aloud-Think Aloud Approach

- Three Key Elements of Scaffolding[2]
  - Social Interaction
  - Visual Representations
  - Written or Spoken Prompts

[2]Lin, T., Hsu, Y., Lin, S., Changlai, M., Yang, K., & Lai, T. (2012). A review of empirical evidence on scaffolding for science education. *International Journal of Science and Mathematics Education, 10*, 437–455

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Reading Aloud

- I decided that we would read all of the text assigned for the class aloud in class, taking turns.
  - My thinking was that this would force the students to actually read the text.
  - The classroom would resemble a study group, with my role as essentially a high-powered study group leader.
    - I would be included among the readers
    - Each of us would read 1-2 paragraphs at a time
    - I would elaborate upon the readings whenever there was an actual question by a student, and whenever I thought the material needed explaining
      - I would use videos, props, other texts, etc. to elaborate & explain

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Classes

- Three classes were involved in this project:
  - Biology 122 (Organismal Biology II) taught Fall 2015 (*N* = 8 students)
  - Biology 119 (Environmental Biology) taught Spring 2016 (*N* = 14 students)
  - Biology 122 (Organismal Biology II) taught Fall 2016 (*N* = 12 students)
- There were a total of 34 students in these 3 classes

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Best with small classes

- I also tried using the technique with one of my sections of Intro Bio non-major classes, Bio 114
- The class had 32 students, rather than the 8-14 in the major classes
- This proved to be too many: it took too long to go through one turn for the class, and I lost student focus and attention
- My own experience was that the technique worked better with class size <15

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Student Buy-In

- At the beginning of each class, I explained what I wanted to do
- Student objections were basically 2 themes:
  - Reading aloud in class is baby stuff
  - Reading aloud is not my learning style
- It was put to a vote, & all 3 classes voted to give it a 2-week trial
- After 2 weeks all 3 classes voted to keep going

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Let's Give It A Try!

- We'll now point to two handouts:
  - A somewhat difficult peer-reviewed scientific article on rapid evolution
    - We'll read the first page or two using RA-TA
    - (click **HERE** for paper)
  - The original RA-TA paper for later reference
    - (click **HERE** for paper)


PeerJ

Rapid morphological change in black rats (*Rattus rattus*) after an island introduction

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Survey

Please rate the following on a 1-5 scale, with 1 = Strongly Disagree, 2 = Somewhat Disagree, 3 = Neither Disagree nor Agree. 4 = Somewhat Agree and 5 = Strongly Agree.

1. It made me read the text more than I would have otherwise.
2. It made me understand the text more than I would have otherwise.
3. Dr. Pergams elaborating on the text was useful to me.
4. In general, I learned how to read difficult texts with greater comprehension.
5. I prefer a class conducted this way over a class with lecture and powerpoints.

The survey sheets were proctored by a student while Dr. Pergams was out of the room

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Results

TABLE 1

Results (2-tailed *P* values) of 1-sample *t*-tests on survey questions, using 3 on a 5-point Likert scale as a null hypothesis.

Bio 122 Fall 2015	Read Text More	Understand Text More	Pergams Elaborating	My "Translating"	Helped Reading In General	Prefer Class This Way
mean	4.13	4.13	4.88	3.69	3.69	3.13
2-tailed P	0.0379	0.0066	<0.0001	0.1885	0.0280	0.7627
(1-sample t-test w/3 as null hypothesis, N=8)						
Bio 119 Spring 2016	**Read Text More**	**Understand Text More**	**Pergams Elaborating**	**My "Translating"**	**Helped Reading In General**	**Prefer Class This Way**
mean	4.07	4.29	4.79		4.21	3.29
2-tailed P	0.006	0.0003	<0.0001		<0.0001	0.3649
(1-sample t-test w/3 as null hypothesis, N=14)						
Bio 122 Fall 2016	**Read Text More**	**Understand Text More**	**Pergams Elaborating**	**My "Translating"**	**Helped Reading In General**	**Prefer Class This Way**
mean	4.25	3.83	4.75		3.75	3.58
2-tailed P	0.0004	0.0172	<0.0001		0.0688	0.0116
(1-sample t-test w/3 as null hypothesis, N=12)						
TOTAL	4.15	4.09	4.79		3.93	3.35
2-tailed P	<0.0001	<0.0001	<0.0001		<0.0001	0.0437
(1-sample t-test w/3 as null hypothesis, N=34)						

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Student Comments

- No longer thought reading aloud was "baby stuff"
- However, those who thought reading aloud was not their learning style did not change their minds
- Concerning [*5. I prefer a class conducted this way over a class with lecture and powerpoints*. 3.35, *P* = 0.04]
  - Students preferred STEM classes taught using reading aloud, but not other classes
  - This makes sense, considering STEM classes have much more jargon

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Conclusions

- Students **very** strongly thought that reading aloud in biology class helped them:
  - Read the text more
  - Understand the text more
  - Thought the instructor elaborating was useful
  - Understand **other** texts more
- And to a lesser extent:
  - Thought other classes should be conducted this way, but only STEM classes
- This technique works better with smaller classes, < about 15

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Application in the Online Setting

- ❑ Especially suited to remote teaching
- ❑ Difficult to assess student engagement with remote lecture material (or even whether students are actually present)
- ❑ Students have to stick around and engage so they don't miss their turn reading

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If you would like to try this technique we'd be happy to help!

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The authors would also like to thank the 34 brave students!

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