

TEACHING AND LEARNING PORTFOLIO

by

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Delta Program in Research, Teaching, and Learning
University of Wisconsin-Madison



The Delta Program in Research, Teaching, and Learning is a project of the Center of the Integration of Research, Teaching, and Learning (CIRTL—Grant No. 0227592). CIRTL is a National Science Foundation sponsored initiative committed to developing and supporting a learning community of STEM faculty, post-docs, graduate students, and staff who are dedicated to implementing and advancing effective teaching practices for diverse student audiences. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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Portfolio Overview

The best teachers are life-long learners. By communicating my teaching and learning philosophy and reflecting on my teaching experiences, I can continue to grow and improve as a teacher. In this portfolio, I highlight some of my teaching experiences that have shaped my ideas about teaching, learning and their relationship to each other.

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The Delta Program

The Delta Program is an NSF-sponsored program connected to the CIRTL (Center for the Integration of Research, Teaching and Learning) Network. The program aims to help current faculty, post-doctoral students and graduate students succeed in improving their teaching practices in the science, technology, engineering and math disciplines.

As a research, teaching and learning community, Delta stands on three pillars:

Teaching-as-Research: “The deliberate, systematic, and reflective use of research methods to develop and implement teaching practices that advance the learning experiences and learning outcomes of students/participants and teachers/facilitators.”¹

Learning Communities: “Bring people together for shared learning, discovery, and the generation of knowledge.”¹

Learning Through Diversity: “Excellence and diversity are necessarily intertwined. Effective teaching capitalizes . . . upon the diversity of their students to enhance and enrich the learning of all.”¹

I will earn the Delta Teaching and Learning Certificate in August 2009 by:

- A. Taking two graduate courses in teaching and learning
 - (1) Diversity in the College Classroom
I broadened my understanding of diversity by exploring the impacts of diversity on teaching and learning in a variety of contexts, including design of course materials, instruction styles and teacher and learner biases.
 - (2) Informal Science Education
I strengthened and reflected upon my abilities to effectively communicate the main points of both my own research and a group-designed science outreach project to the public. The final products were an interactive science museum exhibit and a summative report about the teaching and learning process in informal education.
- B. Actively participating in the Delta learning community through a discussion-based seminar, Research Mentor Training
I evaluated and honed my skills as a research mentor.
- C. Completing a teaching-as-research internship
I gained practical experience identifying a teaching and learning problem and designing, implementing and assessing a solution.
- D. Defending a teaching and learning portfolio

1. The Delta Program Webpage. http://www.delta.wisc.edu/delta_pillars/about_delta.html

Teaching and Learning Philosophy

Successful teaching requires an open and active relationship between teacher and learner because learning cannot occur without the involvement of both. As an instructor, I aim to foster this relationship with my students through three core qualities: being **learner-centered**, **motivating** and an **effective communicator**. These three qualities are interconnected with the three pillars of the Delta Program: teaching-as-research, learning communities and learning through diversity.

To be **learner-centered**, an instructor should facilitate communication between teacher and learner that allows the learner to shape the learning environment. The teacher should strive to create a continual feedback loop between teacher and learner that improves course content, objectives, teaching methods and assessments. My learner-centered strategies are to design feedback mechanisms to evaluate student progress toward learning goals and to ask students how aspects of the course affect their learning. While covering content, I ask questions to the class and to small groups to evaluate student comprehension and application abilities. To gauge student understanding of a concept or reading, I use weekly writing assignments in addition to course exams. Both in writing and verbally, I encourage students to reflect on assignments and activities as they are completing them and to share their successes and challenges with me and their classmates. I also design surveys that ask students to self-report on their learning gains and to explain how course content and teaching methods affected their learning. These types of questions give students the opportunity to explain what they understand and what helped them to understand it, which can be a more informative measure of student learning gains than course grades alone.

A learner-centered approach often lends itself well to teaching-as-research projects, which involve the development, implementation and assessment of instructional approaches in an organized, planned and reflective manner. In my teaching-as-research project with an upper level zoology course, I used information from the previous semester, including my teaching experience, summative assessments and student feedback on learning gains, to design new instructional materials. Throughout the semester, I used formative assessments to monitor the impact of my tools on student learning. Based on this feedback, I revised materials during the course both to maximize student learning gains and to give students a role in shaping their learning environment. Through this experience, I have learned that using student progress and feedback to continually evaluate course learning objectives, teaching methods and assessments is key to making successful changes in the classroom that improve student learning.

Each student enters a classroom with educational, cultural, developmental and social contexts. Thus, an effective learner-centered approach is closely tied to an appreciation of learning through diversity, which means that learning is benefited by and interconnected with diversity. By providing frequent opportunities for student feedback, I allow my students to communicate how they learn best in light of their individual contexts.

I endeavor to **motivate** my students to appreciate and to learn more about science by (1) conveying my commitment to and interest in teaching and (2) encouraging students to make connections between course content and the broader context of their lives. To communicate my commitment to teaching, I tell my students that my primary career goal is to teach at the college level and that their feedback both fuels my growth and improvement as a teacher and gives them the opportunity to influence their own learning. I demonstrate that I value each student's progress and contributions to the classroom by highlighting student's successes and potential to improve. In addition to exhibiting my own commitments, I strive to strengthen student connections to the course. Making

connections between content and students' lives is one of the most motivating and effective ways to enhance learning for all students. In my teaching, I ask students to reflect on connections between the assigned readings, course content and their personal experiences. When students appreciate their role in their own learning, they have the potential to increase their level of understanding and retention of the material as they discover how to make it useful and applicable for themselves.

Another strategy for creating connections between students and the material is to foster learning communities that enhance learning through shared discovery and collaborative interactions. In my teaching, I facilitate discussions to maximize the roles students have in their own learning. Instead of providing all of the answers, I encourage students to suggest many possible answers to a question and to discuss the strengths and weaknesses of each. With practice, students come to rely on each other for information and ideas, which creates functional connections among learners. In learning communities, all students become valuable contributors to the learning environment by sharing their individual insights and talents. Thus, successful learning communities must embrace the idea of learning through diversity and use students' differences to enhance learning and unity.

Communication requires both teachers and learners to play an active role. To be an **effective communicator** as an instructor, I need to clearly explain and provide significance of learning objectives, instructional methods and assessments. I define what learning goals and expectations I have for students, how I will help them to reach these goals through my instructional approaches and how I will measure their success in achieving course goals. It is important to discuss these plans and expectations both at the start of and throughout a course. As we achieve learning goals and begin new ones, I highlight the students' progress and what we will be striving for next. To promote active, effective communication in my students, I elicit student feedback that informs course objectives, teaching approaches and assessments. I provide many opportunities for communication via multiple forums (e.g., formal and informal surveys, consistent office hours and e-mail availability). To demonstrate that I listen to and appreciate their feedback, I take time to summarize their comments and to discuss how we could modify the course based on our course goals and their ideas.

Effective communication also requires an appreciation of learning through diversity, and an instructor should be aware of what student differences in ethnicity, gender, experience, preferred learning styles and socioeconomic backgrounds bring to the classroom and how these differences affect learning. In my teaching, I aim to design course learning objectives and teaching methods to maximize learning for all students. Through surveys and assignments, an instructor can learn about some aspects of classroom diversity. However, one of the best ways to promote diversity is to develop an inclusive learning environment that encourages all students to share their ideas and experiences. I convey to my students how much they can gain from learning communities that foster diversity in my syllabus, on the first day of class and throughout the course. As a class, we practice creating space for each student to contribute. I also use small group activities and have students teach their peers, which encourage students to share their insights and experiences with each other. Through these approaches, I aim to engage and to promote learning for all students.

My qualities of being learner-centered, motivating and an effective communicator foster the open and active relationship I seek to create with my students. I value being a receptive and engaging communicator, and I continually push myself to adjust my teaching methods to best fit each group of students. I aim to strengthen each student's connection to the course content, their peers and their instructor, which enhances student learning and learner satisfaction. I teach whole-heartedly, and I am dedicated to continuing to grow as an instructor to maximize my positive impact on learners and, more broadly, the teaching and learning community.

Reflections on the Application of my Philosophy in my Teaching Experiences

Reflection on a Learner-Centered Approach

The first semester I taught the discussion sections for an upper level zoology course, I found that students often came to discussion with a limited, or even incorrect, understanding of the main points of the assigned reading. The lack of understanding was apparent in both the students' superficial questions asked during discussion and their article summaries, which often missed one or more main points of an assigned article. The learning objectives for discussion sections were for students to recognize, understand, discuss and apply the main points of scientific articles read each week. To help students achieve these goals, I needed to focus in-class discussion on the recognition and understanding of each article's main points because students did not master these objectives before discussion. This focus detracted from the potential for in-class discussions to encourage critical analysis of articles and connections between articles, lecture material and personal experience.

Upon reflection, I realized that a more learner-centered approach that allowed student feedback to modify aspects of the course had the potential to improve student achievement of learning goals. As I prepared to teach this class for a second time, I aimed to improve student comprehension of the articles' main points prior to attending discussion. This would enable our in-class discussions to focus more on higher-level learning objectives, including discussion and application of the articles' main points. I used my teaching experiences and assessments of learning gains from the previous semester to design new instructional methods and materials. I also used this opportunity to conduct a teaching-as-research project.

My instructional approaches to improve student ability to recognize, understand, discuss and apply the main points of scientific articles were twofold. The first involved instruction of reading strategies designed to improve reading comprehension. In the first week of discussion, I explicitly modeled the effective application of reading strategies used before and during reading. I also guided in-class group practice of reading strategies on a scientific article. Additionally, I facilitated class discussions on student experience with and plans for using reading strategies effectively. Throughout the semester, I encouraged the use of "after reading" strategies by asking students to complete and design graphic organizers (see Appendix A) and to write article summaries. Both of these strategies help readers to synthesize the main points of scientific articles.^{1,2,3}

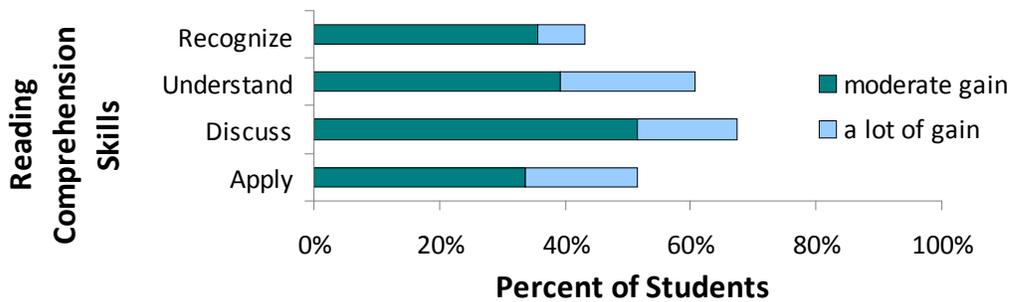
The second instructional approach was the use of guided reading handouts, which asked questions that monitored the reader's comprehension and directed the reader to the article's main points. I designed guided reading handouts (see Appendix B) to promote the use of reading strategies before, during and after reading. Before reading, the handouts encouraged students to preview the framework of the article and describe their expectations for what information would be presented. During reading, students could monitor their comprehension of each section of a paper (e.g. introduction, methods or results) by answering section-specific questions on the handout. After reading, the handouts also asked students to make connections to other articles, lecture material and previous experience (see Appendix C), which aimed to strengthen their understanding and retention of the article's content.

Using a learner-centered approach, I gave students a voice and a responsibility to shape their learning environment. At the end of each discussion, I asked the class to succinctly summarize the main points of the article and to generate at least one potential exam question. I designed exam questions based on these conversations and student article summaries, which gave students a role in determining the content on course assessments. Throughout the semester, students could also influence the

instructional methods by giving feedback on written and oral surveys. I asked students what parts of the instructional methods worked well and poorly for them and what changes they would suggest. Using this student feedback, I revised guided reading handouts (see Appendices A.1 and A.2 for original and revised guided reading handouts) and focused my comments on their assignments to specify how each student could improve (see Appendix B for student feedback and examples of my comments given before and after student feedback).

I assessed the efficacy of these instructional approaches and materials through pre- and post-surveys that tracked changes in student use of reading strategies and perceived understanding of the scientific articles' main points. The post-survey also asked students how instructional approaches and materials affected their learning of reading strategies and their comprehension of the main points in scientific articles. In addition to student-reported learning gains, I tracked exam grades for article questions over the course of the semester.

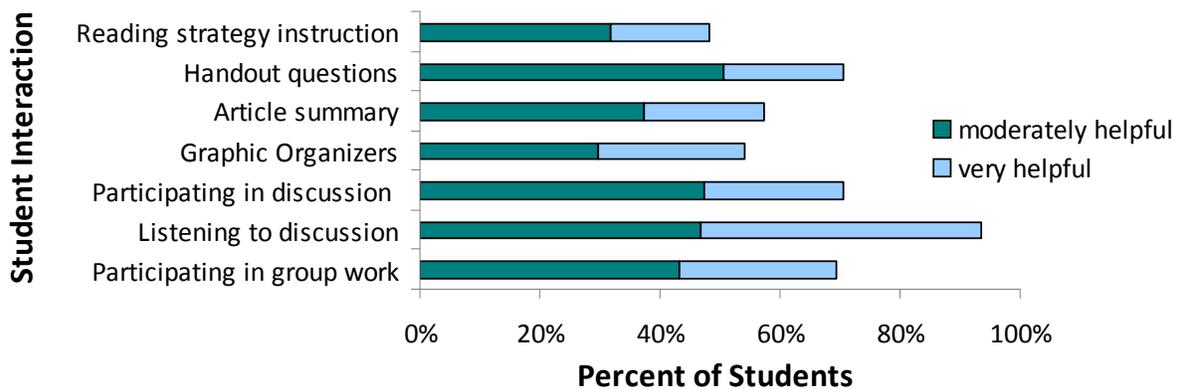
Figure 1. Moderate to High Student Gains in Reading Comprehension Skills for Article's Main Points



Percentages are based on 95 total respondents. Other response categories: "no gain" and "a little gain."

As an outcome of my learner-centered approach in this teaching-as-research project, students improved their abilities to recognize, understand, discuss and apply the main points of scientific articles, which were the primary learning objectives for this course (Figure 1). When asked what they would carry with them from this course into other courses and other aspects of life, 59% of students (50 out of 84) said improved active reading skills. Both instructional approaches, teaching the effective use of reading strategies and assigning guided reading handouts, helped student learning (Figure 2).

Figure 2. Helpfulness of Student Interactions with Content



Percentages are calculated based on total number of respondents for each student interaction: 91, 95, 95, 94, 94, 95, 95, 91 respectively. 'Reading strategy instruction' is the average of three components: modeling, in-class practice and discussion of reading strategies.

Students reported that guided reading handouts helped their learning by structuring their reading (57%, 41 out of 72 responses), improving their comprehension (28%, 20 out of 72 responses), and strengthening their retention of the article's information (16%, 11 out of 72 responses). Using changes in exam grades throughout the semester, I was unable to detect an effect of the instructional methods on student learning gains because grades were strongly affected by differences in course content across exams. (See Appendix C for more detailed outcomes of student learning gains.)

Based on student-reported learning outcomes, I would extend reading strategy instruction beyond the first week of class to increase its potential to improve student learning. Throughout the semester, I would have students discuss in small groups and then as a class how they used reading strategies for their reading assignments, what comprehension problems they encountered and how they could solve these problems using reading strategies. On the guided reading handouts, I would ask students to reflect on how their use of reading strategies aided their comprehension. To further monitor student use of reading strategies throughout the semester, I would add a mid-semester survey of reading strategy use. The results of this survey could also be used as the subject of a class discussion to reflect on how reading strategies help student learning.

Another improvement I would make based on student feedback is to highlight how writing article summaries helps to strengthen understanding of material. In the first three weeks of class, students would submit both answers to the guided reading handout questions and article summaries. As a class, we would discuss how guided reading handout questions helped to structure summary writing. Each week, I would provide individualized comments for improving students' summaries. In the third week of class, students would peer-review each other's summaries and provide feedback on how to clarify the article's main points. After the first three weeks, I would assign either answers to the guided reading handouts or article summaries on alternate weeks. In the last three weeks of class, I would ask students to submit only article summaries. My aim would be to improve student understanding of the main points and their ability to synthesize the article's information in their own words.

I have already adapted the instructional materials and methods used in this project to design a workshop for improving comprehension of scientific articles for undergraduate biochemistry students. I also used these materials in an upper level animal behavior course I taught that required extensive reading of scientific articles. In the future, I can envision using these materials to launch a seminar for undergraduates and/or graduate students beginning science degrees.

Through these experiences, I have come to value how the learner-centered approach connects me more deeply to the material and to my students. Additionally, students gain confidence in and responsibility for their learning when they feel that their opinions and progress in the course affect my teaching approaches and their learning environment. I feel rewarded to have identified a problem in my course, designed and assessed a solution, and found that my efforts resulted in improved student learning.

¹Fielding, L.G., and P.D. Pearson, 1994 Reading comprehension: What works. *Educational Leadership* **51**: 63-67.

²Gillis, V.R., and G. MacDougall, 2007 Reading to learn science as an active process. *The Science Teacher* **74**: 45-50.

³Walton, S., 2006 Three steps for better reading in science before, during, after. *Science Scope* **30**: 32-36.

Reflection on Student Motivation Strategies

As an instructor, I aim to motivate students to appreciate and to learn more about science. To achieve this, I exhibit my commitment to teaching and connect learners to course material and to each other. These strategies motivate students by (1) making them feel like important, active members in our course's learning community and (2) helping them to find value in course material.

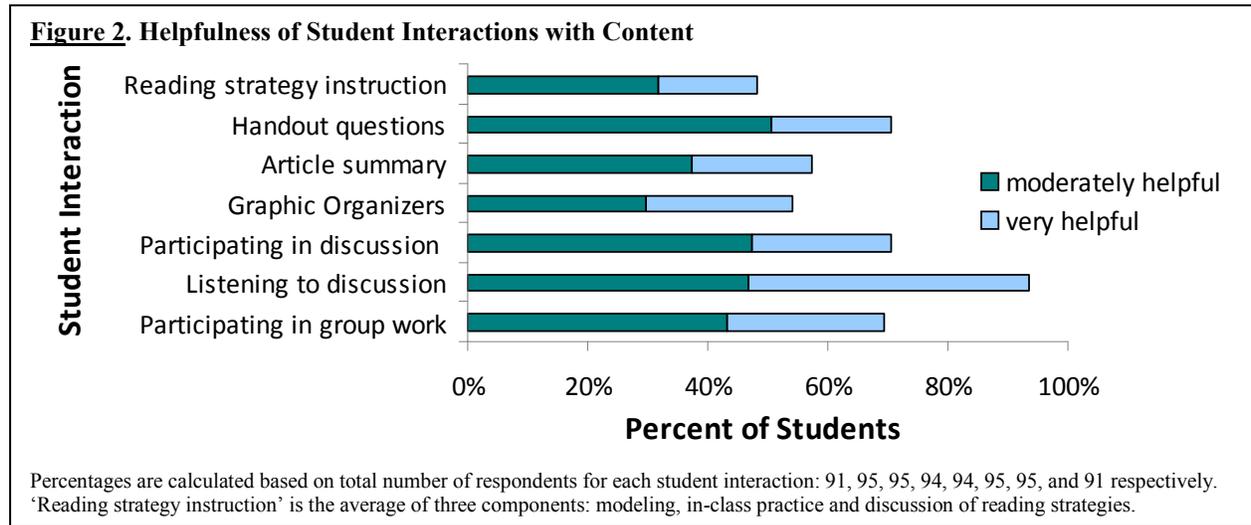
I strive to motivate students by conveying my commitment to and interest in teaching. I tell my students that I plan to continue teaching in my career and that I value their feedback in fostering my growth as a teacher. I also share that I appreciate the teaching process and their progress as students. This seems to make my students feel more comfortable asking questions about the content and making suggestions to improve teaching methods. For example, when I implemented new teaching approaches in one of my courses, I told students that I was trying new methods designed to improve their success in achieving specific course learning objectives. I explained that I would ask periodically for their feedback about how to improve the new methods, and I also encouraged them to contact me any time they had ideas to contribute. Students readily shared their ideas for improvement, and I made changes throughout the semester based on their feedback (see Appendices B and D for examples). I also demonstrate my commitment to teaching by communicating my willingness to support student learning and by making myself available to students both in and out of the classroom. This gives students more individual attention and enables me to tailor my guidance to individual student's needs.

I aspire to motivate students by encouraging them to make connections between course content and the broader context of their lives. When starting a new topic, I communicate course learning goals and their importance both for the course and in students' lives. On the first day of introductory biology labs, I performed an exercise with my students that had them identify all of the skills they would need in their future careers, regardless of their field of work. I then connected each of those skills to tasks we would accomplish during the semester. In an upper level zoology course I taught, I asked students to connect the ideas from assigned readings to lecture material, other articles read and personal experience (see Appendix C for examples of student responses). This approach aims to strengthen student understanding and retention of the article's content.

It is motivating not only for individuals to make connections between their lives and the course content but also for students to make connections to each other. During lecture, I make sure to include a variety of ways for students to connect to the material and to each other. In addition to PowerPoint slides, I also generate an outline of the lecture's content on the board that I have the class help me to fill in as we cover each point. After covering a section of material or a major point, I use the outline to make comparisons between other sections. I facilitate small group discussions multiple times throughout class and encourage engagement by moving around the room and talking with many small groups and individuals. This not only connects students to each other, but it also monitors their comprehension during class.

Small groups of students, such as those in discussion or laboratory sections, are ideal for fostering learning communities, which enhance learning through shared discovery and collaborative interactions. To help my students connect to each other, I facilitate discussions of productive and nonproductive group behaviors. I ask my students to identify their positive and negative behavioral tendencies in groups and to share them with their group members. This helps students to see how their strengths and weaknesses fit with their group members and to recognize when they and other members of their group are performing nonproductive behaviors. I also have my students problem-solve in small groups and share potential solutions between groups before coming together as a class to discuss potential answers. Through this group work, students learn from and make functional connections to each other. In one of my courses, 70% of students (63 out of 91) reported that participating in group

work helped their learning (see Figure 2 for student-reported helpfulness of group work compared to other forms of classroom interaction).



Overall, the key to student motivation is to enliven the material. As a teacher, my responsibilities go beyond simply presenting material to the students; I must make the material intriguing, relevant and engaging. I accomplish this through my explicit commitment to and interest in teaching, efforts to make the content broadly applicable to student lives and endeavors to create learning communities.

Reflection on Effective Communication

To communicate effectively, I clearly define and explicitly explain my teaching and learning objectives and expectations for students. In my syllabi, I define the course goals and how students will be assessed (see Appendix F for a portion of one of my syllabi that defines goals and assessments). I also communicate the daily goals at the beginning of class (see Appendix G for an example of my lesson plans). Explaining the goals for each week and for the semester helps students to focus on the learning objectives. I communicate to the students how they are progressing throughout the semester by giving them weekly feedback on assignments describing their achievements and ways to improve (see Appendix D.3 for example feedback). I would like to examine the role that explicit coverage of course goals has on student learning. In a course with multiple sections, I could explain course objectives, expectations and assessments for one course module in first section but not in the second. Then for the next course module, I would explain the goals to the second section but not to the first. I could then ask students to compare their learning experiences across modules when they did and did not have explicit coverage of course goals while controlling for differences between course modules.

Communication requires give and take of information between teacher and learners. Thus, it is important not only to communicate to my students but also to provide opportunities for my students to play a role in shaping their learning environment by giving feedback on course content and teaching approaches. To encourage open communication, I explain to the students that I am interested in their feedback through my syllabus (see Appendix F) and verbally throughout the semester, especially on the first day of class. I elicit student feedback in multiple ways, including formative and summative written surveys, verbal questions asked in class, and e-mailed questions to the class. I follow through with this communication by addressing their responses and my plans for incorporating their ideas into the course. Encouraging student feedback gives students responsibility for their learning, which I expect makes them more connected to the course and the material. To test this hypothesis, I could survey students to ask how giving feedback affects their learning and perceived involvement in the course.

Effective communication also entails consideration of student diversity, and I embrace the idea that learning is benefited by diversity. To be an effective teacher for students with different backgrounds than my own, I use teaching and learning approaches that address both differences in how students learn and the diversity of student perspectives. One approach is to include as much variety in my teaching styles as possible. For example, I present material using visual, auditory and hands-on learning modalities to address differences in how students learn. When I modeled reading strategies in one of my courses, I read a text aloud that was projected on the classroom wall. As I read, I visually demonstrated the use of different strategies. Students also had a copy of the text upon which they could practice reading strategies. After modeling the strategies, I asked students to practice using them on a new text selection. Another approach I use is to have students teach or present material (e.g., leading discussion or creating study guides), which increases the variety of ways in which information is presented and often produces new ideas and styles I have not yet imagined.

Teaching and learning cannot occur without communication. The more effective that communication is, the more successful the teaching and learning process will be. I communicate effectively as an instructor by conveying the learning objectives, assessments and outcomes of the course and their significance; creating opportunities for feedback and change; and tailoring my teaching methods to each group of students.

Appendices: Evidence of my Engagement in Teaching and Learning

Appendix A: Evidence of instructor- and student-generated graphic organizers

Appendix A.1: Graphic Organizer 1 – Instructor-generated

Fill in the graphic organizer below using information from the article and from your guided reading handout answers above.

Objective 1:	Objective 2:
Hypothesis :	Hypothesis:
Prediction:	Prediction:
Test:	Test:
Conclusions:	Conclusions:

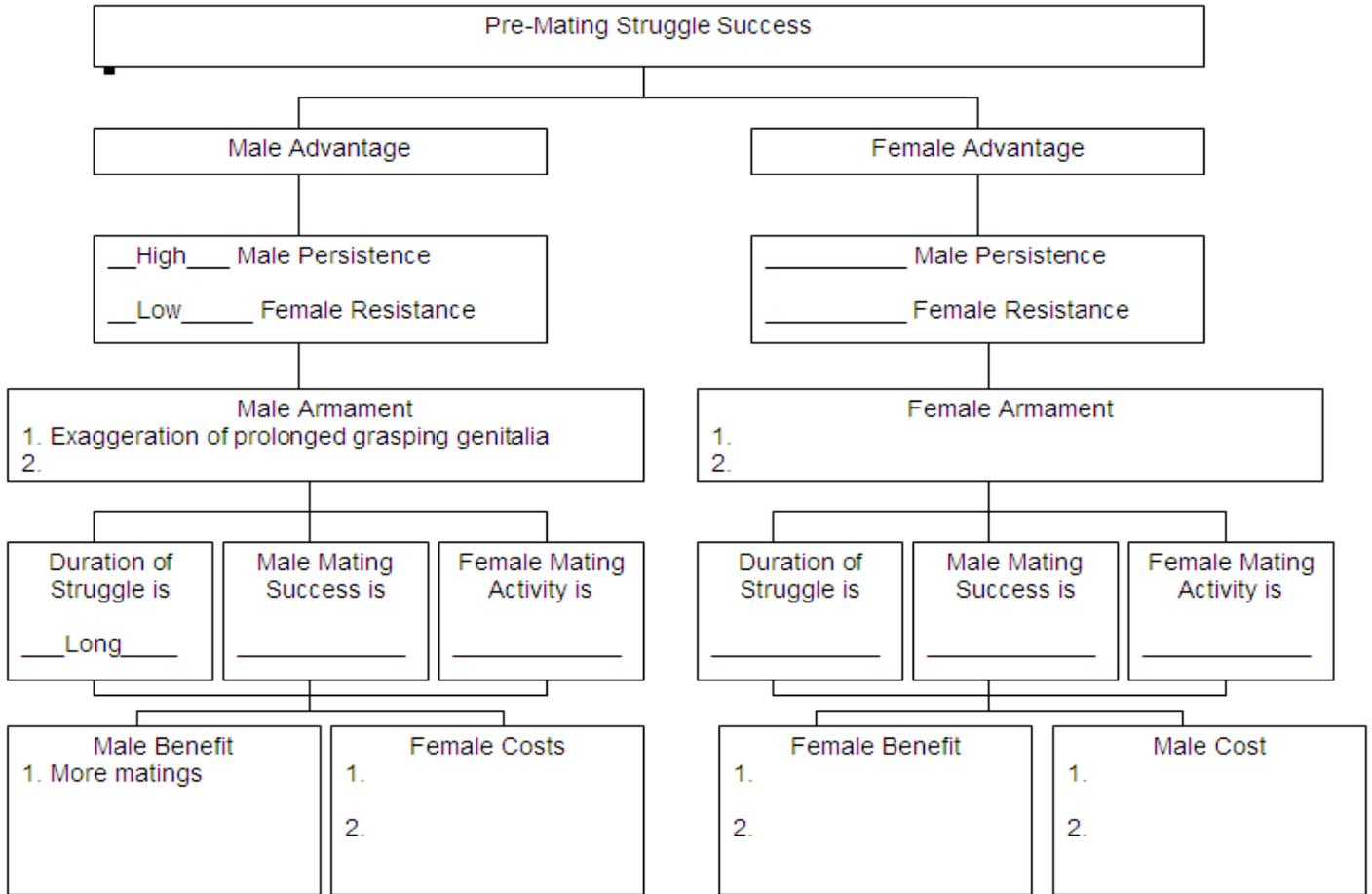
Appendix A.2: Graphic Organizer 2 – Instructor-generated

Fill in the graphic organizer below using information from the article and from your guided reading handout answers above.

Under each heading, describe what mechanisms might aid or prevent the initial spread and maintenance of aposematism and how this could happen.

Predator Behavior	Variation in prey profitability	Variation among predators	Temporal & Spatial variation

Appendix A.3: Graphic Organizers 3 & 4 - Student-generated



After looking over the data from the corresponding figures put an “X “ in the boxes when the wrens should show significant aggressive behavior and a dash where there is no significant displays of aggression. The top rows in each table are the calls played back and the far left column are the locations of the played calls.

Discrimination Between Family Groups (Figures #1 and #2)

	Own Call	Relative's Call	Stranger's Call
Boundaries			
Center			

Discrimination Within Patriline (Figures #3 and #4)

	Own Call	Relative's Call
Boundaries		
Center		

Response With or Without Males Helpers (Figures #5 and #6)

	With Male Helpers	Without Male Helpers
Own Call		

Appendix B: Evidence of revision of instructional materials based of student feedback

Appendix B.1: Original Guided Reading Handout

Guided Reading Handout: Zoo 425

Article Author & Year: _____

Based on your overview of the article's structure (title, subtitles, figures):

What do you predict this article is about?

After reading the abstract:

What do you expect this article is about?

What do you think you already know about this topic? [Answers can be scientific or personal.]

What are you curious to learn or what do you think you do not know about this topic?

After reading the introduction:

What is the general topic introduced in the article?

What are the specific questions/ hypotheses/objectives the authors aim to address?

In your own words, define 2-3 key terms introduced in the article.

After reading the methods:

Using your own words, summarize the general methods in 1-2 sentences.

What questions do you have about how this study was conducted?

What concerns do you have about how the methods used may affect the results of this study?

After reading the results:

What are the main findings of the article?

After reading the discussion:

What do the author(s) consider to be the important conclusions from this study?

Do you think that the results clearly support these conclusions? Why or why not?

Do you agree that these conclusions are important? Why or why not?

Why are these conclusions, or why is this study as a whole, important in a broader context (e.g., in other animal taxa, in other environments, to the scientific community, to human society)?

What questions do you have after reading this article?

What connections can you imagine between this study and:

Lecture material?

Information you have gained from other classes or personal experience?

Use the answers to the questions above to help you to write a brief summary of the article.

Response should be ½ page.

Appendix B.2: Revised Guided Reading Handout

Questions on the results are specific to each article to focus students' attention on key results. Other questions are now combined to encourage synthesis of material.

Guided Reading Handout: Zoo 425

Article Author & Year: _____

After previewing the article's structure and reading the abstract/introduction:

What is the general topic introduced in the article?

What do you already know and/or what do you think you will learn about this topic?

What are the specific questions/ hypotheses/objectives the authors aim to address?

In your own words, define 2-3 key terms introduced in the article.

After reading the methods:

Using your own words, summarize the general methods in one-two sentences.

After reading the results:

What differs between parts a & b for Figure 1? For Figure 2? For Figure 3?

What are the other main findings of the article that you did not describe above?

After reading the discussion:

What do the author(s) consider to be the important conclusions from this study?

Why are these conclusions important both for this study & in a broader context?

What questions do you have after reading this article?

1)

2)

Imagine connections between this study and at least 1 of the 3 topics below. Explain why the connection exists.

Lecture material?

Previous discussion readings?

Information you have gained from other classes or personal experience?

Use the answers to the questions above to help you to write a brief summary of the article that covers the main content of the paper (introduction, main questions, methods used to address those questions, overall findings, conclusions, and significance).

Response should be ½ page. Include your summary below, single-spaced.

Appendix C: Evidence of student connections between course material and personal experience

Guided Reading Handout questions and student responses.

What connections can you imagine between this study and:

Lecture material?

This connects with natural selection trade-offs discussed in class. If sexual selection dictates that females will choose males with more ornamentation then there will be a selective pressure to have more ornamentation. However, if having more ornamentation makes you vulnerable to predators, there will be a pressure exerted from the environment to shrink the size of ornaments. This will result in a stabilizing selection which decreases variation in the population.

We talked about how certain monkeys elicit different alarm calls for snakes or hawks or a cheetah or something else and that each call produces a different behavior in the rest of the group. These calls seem to be specific to the predator involved, however the young must learn how to respond and call for these warnings. In this paper, the difference in response was not due to a developmental issue rather a characteristic of the specific dangers that pose the young at this age (i.e. not aerial predators because they are sheltered in the nest).

Previous discussion readings?

Coloration seems to play many roles in organisms from attracting the opposite sex to deterring predators. I think it is interesting how it plays such an important role in the life of an organism.

Just like stripe-backed wrens, meerkats are also cooperative breeders. Also, both articles mention the avoidance of inbreeding but through the use of different cues. While the wrens use family specific calls to recognize related individuals and avoid inbreeding, dominant meerkat females seem to control the breeding of subordinate females.

Information you have gained from other classes or personal experience?

As a child I remember learning about the pattern of the scarlet king snake (red rings touching the black rings) and the poisonous coral snake (the red rings touch the yellow rings) an example of aposematism and I wasn't even aware.

I have always wondered in awe at how such complex and cooperative behavior arises in prairie dogs and meerkats. These mammals do not possess the "consciousness" that humans have, nor the ability to reason (keeping in mind that we know this only to the extent of the best of our knowledge). So how do such communities arise and what—if anything—keeps social order (i.e., how do the communities remain stable)?

I learned in endocrinology class about female pheromones regulating reproductive cycles of other women around. We learned about the dominant/subordinate relationship in some animals in which subordinate females respond less to GnRH. They, therefore, have lower levels of LH which stimulates ovulation. They are then less reproductively receptive to males. I find it interesting that it is not the case with meerkats. Subordinate and dominant meerkats seem to have similar levels of LH response to GnRH. However, dominant meerkats have higher estrogen metabolites in their feces.

Appendix D: Evidence of impact of student feedback on instructor's communication

Appendix D.1: Examples of instructor's original comments.

Focus is on what students did well.

All handout questions are addressed and you have demonstrated your understanding of the different selective pressures on predators and prey. You also make it clear that there is a lot to be learned about the evolution of aposematism.

You demonstrated your understanding of the different selective pressures on predators and prey. Thanks for your thoughtful responses and questions. I was curious about your question concerning the prey reverting back to displays of ancestors. Why might this occur?

Well-written. Try to rephrase the authors' words instead of quoting them. It will help you remember the information better.

I can tell that you grasped the different factors that influence aposematism and how they might affect its evolution. A review article surveys primary literature for published data/conclusions & usually describes trends that were repeated multiple times in the literature. So, there probably isn't too much concern about this being unfounded information. But I'm glad you're questioning & being critical.

I thought your first discussion question about the ramifications for speciation was particularly intriguing.

Thanks for your thoughtful responses. It is clear that you have thought about the different mechanisms of aposematism and how certain conditions can affect its evolution. Good discussion questions posed. I also found it interesting to hear about your experience with learning about king snakes and coral snakes.

It is clear that you've thought about how aposematism might evolve and what conditions affect this. Good discussion questions. I thought your idea about testing patterns of aposematic evolution with a phylogeny was particularly interesting.

Appendix D.2: Student feedback on instructor's comments on weekly assignments

First statement made to students:

I use weekly assignment feedback in which of the following ways:

Not at all	Just for the grade	For the grade and comment
6	8	62

Total responding = 80

Of possibilities of types of feedback students would find useful, the vast majority of students (62/76 responding, 95%) would find both the grade and comment helpful.

Second statement made to students:

I would find the following types of comments useful:

What I did well	How I can improve	Only what I need for the exam
9	64	7

Total responding = 80

Of possibilities of types of comments students would find useful, the majority of students (64/80 responding, 80%) would find suggestions for improvement most helpful.

Appendix D.3: Examples of instructor's revised comments.

Focus is now on ways for students to improve.

In your summary, the results are described, but you could elaborate on the conclusions and significance of the work.

Your understanding of the conclusion that nestling responses to alarm calls are adaptive because of different predation risks is clear. One point to think about - how did the authors distinguish between the hypothesis they tested about responses to ground vs. aerial and the hypothesis they tested about responses to long vs. short calls?

From your summary, it is not clear how 5 and 11 day old nestling responses differ. I would suggest reviewing these results before the exam.

Your understanding of the results are clear. What do the authors conclude about the imperfect stage vs. adaptive response explanations introduced in the beginning of the article?

To improve your summary, write it as if you were aiming to inform other students about the main content of the article. Your current writing style is more informal, as if you were writing a letter to someone you know. Changing your writing style to inform an outside audience will likely create a summary that focuses on the main content of the paper and provides a better review for you before the exam.

Review the article to note the differences in how each hypothesis was tested, especially kin selection & by-product mutualism.

Your understanding of the overall conclusions is clear. Your summary could have elaborated on how the authors demonstrated that reciprocal altruism was occurring in this population.

Your understanding of the conclusions is clear but review the paper to remind yourself how the authors tested each hypothesis - what evidence would they need to support/refute each hypothesis? This could have been more clearly described in your summary.

Appendix E: Evidence of student learning gains in teaching-as-research project

Student Learning Gains

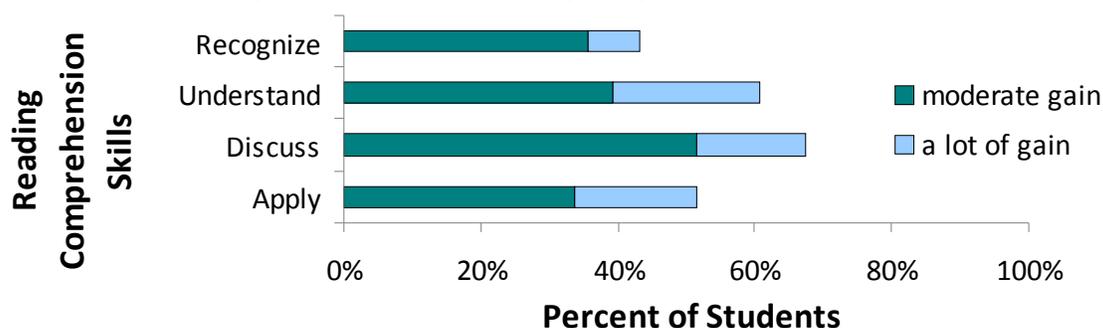
Through this course, students improved their reading comprehension of scientific literature and strengthened their active reading skills. Between 85-93% of the students reported some gain in their abilities to recognize, understand, discuss, and apply the main points of scientific articles (Table 1). Considering only the categories of 'moderate gain' and 'a lot of gain,' over 50% of students reported improvements in their abilities to understand, discuss, and apply the main points of scientific literature (Figure 1). Students reported the largest gains in their abilities to discuss the main points of scientific articles.

Table 1. Student Gains in Reading Comprehension Skills for Article's Main Points

Gains in ability to:	no gain	a little gain	moderate gain	a lot of gain
Recognize main points	14.7% (14)	42.1% (40)	35.8% (34)	7.4% (7)
Understand main points	13.8% (13)	25.5% (24)	39.4% (37)	21.3% (20)
Discuss main points	7.4% (7)	25.3% (24)	51.6% (49)	15.8% (15)
Apply main points	7.4% (7)	41.1% (39)	33.7% (32)	17.9% (17)

Percentages were calculated based on 95 total students responding for each of the four reading comprehension skills. Actual number of students responding is shown in parentheses.

Figure 1. Moderate to High Student Gains in Reading Comprehension Skills for Article's Main Points



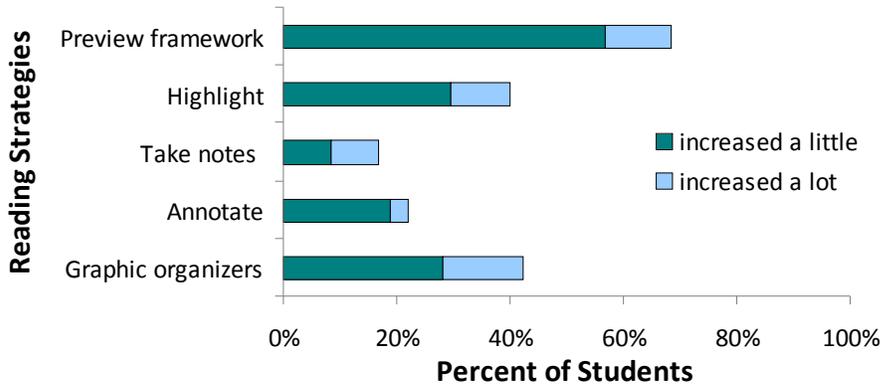
Percentages are based on 95 total respondents. Values shown are also found in Table 1 under 'moderate gain' and 'a lot of gain' categories.

An open-ended post-survey question asking students what they would carry with them from this course provided strong evidence for student learning of reading strategies and reading comprehension. Fifty-nine percent (50 out of 84 responses) of the students responded that they would carry improved active reading skills with them into other courses and other aspects of life. Other responses included improved understanding of class content (15%), improved abilities to apply information from scientific literature (8%), and improved attitudes toward scientific literature (6%).

Effectiveness of Instructional Approaches

I used three approaches for reading strategy instruction: modeling, practicing, and discussing the effective use of reading strategies. Students reported that these three strategies were equally helpful in their learning of reading strategies (80%, 74%, and 78%, respectively). As a result of the reading strategy instruction and the students' experience using reading strategies throughout the semester, students reported the largest increase one specific strategy, previewing the framework of the article (Figure 2). Even before explicit instruction of effective use of reading strategies, this strategy was the most commonly used (85% of students). Thus, the increase in use of previewing the framework is not solely because it was rarely used. Instead, these results suggest that students learned how to use this strategy more effectively, which lead to increased use.

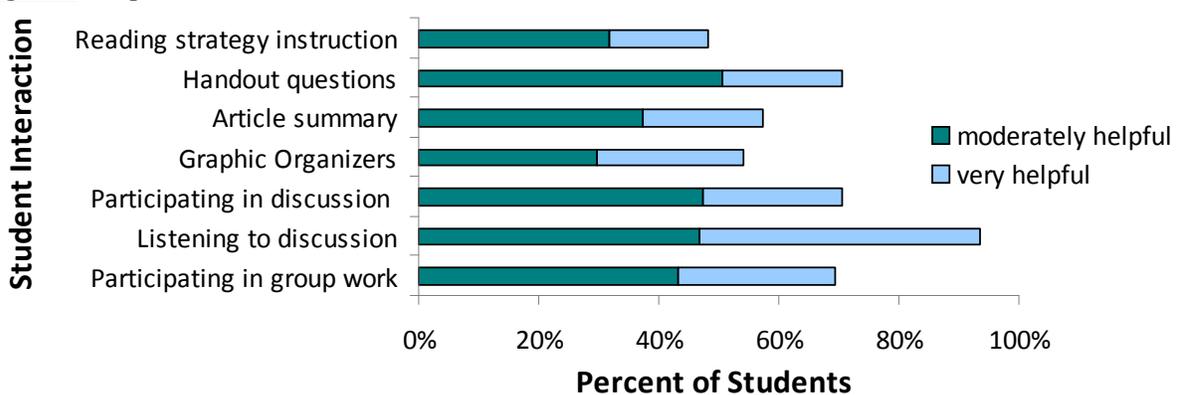
Figure 2. Increase in Use of Reading Strategies



Percentage of students is based on 95 respondents for all strategies except 'Using graphic organizers,' which had 92 respondents. Other response categories were 'decreased a lot,' 'decreased a little' and 'no change.'

In addition to the use of reading strategies, the course promoted many other ways of interacting with the content of scientific literature, including listening and participating in discussion, completing guided reading handout questions, writing summaries of articles, and using graphic organizers. Students rated listening to discussion as most helpful compared to the other types in interactions (Figure 3). Ninety-three percent of students (88 out of 94 students) reported that listening to discussion was moderately to very helpful (Figure 3). More than the majority of students rated participating in discussion as helpful to their learning of the scientific articles' content (70.5%, 67 of 95 students). This provides evidence suggesting that discussion allows readers to strengthen their reading comprehension, which is consistent with previous studies. Students rated completion of guided reading handout questions to be equally helpful to participating in discussion. The majority of students rated writing article summaries and using graphic organizers as moderately to very helpful (57.4% and 54.3%, respectively), but these interactions were slightly less helpful than other available interactions.

Figure 3. Helpfulness of Student Interactions with Content



Percentages are calculated based on total number of respondents for each student interaction: 91, 95, 95, 94, 94, 95, 95, and 91 respectively. 'Reading strategy instruction' is the average of three components: modeling, in-class practice and discussion of reading strategies.

Of the students that found completing the guided reading handout questions to be helpful, including students that responded 'a little help,' 'moderate help,' and 'a lot of help,' the majority of responses (57%, 41 out of 72 responses) explained that the guided reading handouts helped their learning by structuring their reading. Student also stated that guided reading handouts helped their learning of scientific articles by improving their comprehension (28%, 20 out of 72 responses) and strengthening their retention of the article's information (16%, 11 out of 72 responses).

Appendix F: Evidence of defining learning objectives and assessment techniques in a course syllabus

Zoology 425
Evolution of Behavior
Discussion
TA: Alycia Reynolds Lackey

Email: acreynolds@wisc.edu
Phone: 262-4437
Office: 426 Birge Hall
Office Hours: Tues 1 to 2 & by appointment

Purpose: The discussion section is to give students experience in reading about and presenting scientific research in animal behavior. Students are expected to read the assigned papers from scientific journals thoroughly and come prepared to discuss the paper in class. Weekly assignments are meant to prepare students for discussion. Each week a different group of students presents the results of the paper and leads the discussion of it for the class.

Weekly Assignments: Each student is required to complete a handout with questions about the reading and turn in a typed ½ page summary of each week's paper and 2 questions about the paper at the beginning of discussion. Questions can be either about the content or the ideas of the paper, but are meant to show that you have read the paper. Try to print out a second copy of your questions, so you have them for discussion. Make sure that both your name and section number are on the summary and questions.

The assignments will be graded with a check plus (full credit), check (partial credit, either portions of the paper were missing from the summary, the handout was partially completed, or only one question was included), and check minus (half credit, the summary doesn't display the fact that you read the paper, the handout was half complete, or no questions were included). After the second week of discussion, late assignments will not be accepted after your scheduled discussion.

Attendance/Participation: Your discussion grade is based on your participation in discussion (See Grading below). You get partial credit for coming to the discussion, but need to participate regularly to get full credit. Preparing two questions in advance is meant to give you an easy way to join in the discussion, by asking your questions. Remember there are no stupid questions. Discussion should be a setting in which you feel comfortable to put forth your questions and ideas about the papers we discuss. Please let Alycia know if this is not the case, or if you are having problems speaking in front of the class.

Missing discussion:

If you will miss discussion due to illness or other extenuating circumstances, please contact Alycia as soon as possible (preferably 24 hours before your scheduled discussion) and plan to attend any of the other discussion sections that week. If you are unable to make it to any of that week's discussion sections, you may submit your handout answers, summary, and discussion questions via e-mail. This allows you to earn credit for that week's assignment. To earn credit for your missed discussion participation, email Alycia to request the assignment of a supplemental paper to read and summarize. Your one-page summary will be due within two weeks of the missed discussion. If you miss discussion but do not have an excuse, you can still turn in your handout answers, summary and questions via email. This enables you to earn credit for your assignment but not your participation. Your assignment must be received on the same day as your regularly scheduled discussion to earn credit unless there are extenuating circumstances. Please let Alycia know in advance of any circumstances that prevent you from arriving on time or completing your work. In the first two weeks of class, I should be notified of any conflicts you may have.

Presentations: Each week one or two students will present the assigned paper and lead the class discussion of the paper. Students will sign up to lead discussions the first time we meet. The presenter(s) should prepare a 7-10 minute oral summary of the paper and bring questions for the group to discuss. All presenting groups must meet with Alycia the week before they lead discussion to talk about the paper and how you can prepare your discussion. Please e-mail Alycia to set a meeting time.

Your summary should include a brief overview of the main question of the paper, the significance of this question, the methods used, and the results of the paper (which includes explaining the figures in the paper). It

should also include the conclusions that can be drawn from the results and how the paper relates to topics covered in lecture.

Questions for the class should be designed to provoke critical analysis of the paper. Do the results of the paper answer the main questions posed by the researchers? Were all the predictions met by the results (why or why not)? Were there any unexpected results and how were these explained? Do you believe the conclusions of the researchers? Was the design of the experiment(s) appropriate or could it be changed to give clearer results? What unanswered questions are there? What future studies could this research lead to? Questions about the content of the paper, especially confusing sections, can also be brought up in discussion. If you found one part of the paper confusing, chances are others did too. In order to lead a good discussion on your paper, you must make sure you understand your paper thoroughly. I will help with the discussion, but you and your group members are expected to be the experts on your paper. A grade will be given to the group based on the presentation of the paper. You can split up responsibilities for the presentation within the group, but each group member is expected to understand the whole paper.

Grading: The grade for discussion comprises 25% of your class grade. It will be based on weekly assignments (1/3), weekly participation(1/3), and your presentation (1/3).

Office Hours: Please see me as a resource. I am here to help you to succeed, to learn, and to aid your personal development as a student. Please ask questions when you need help. I prefer to meet with students during my office hours or scheduled appointment. If you e-mail me a question, please formulate your e-mail questions in a Yes/No format so that I can effectively and succinctly answer you. If your question does not lend itself to a Yes/No format, then plan to talk to me in person before/after discussion or in my office.

Statement of Inclusiveness: We would like this discussion to be an inclusive learning environment. We are all encouraged to share our experiences and perspectives because the group will benefit from learning about diverse backgrounds and ideas. We will expect each student to be open to and respectful of the contributions of others.

Appendix G: Evidence of communication strengths in a lesson plan

Week 1 – 425 Discussion

Sept. 3 & 4, 2008

Intro to Discussion, Explicit instruction of reading strategies

- 1) Intro of classmates and TA 5 min
 - Prepare to share with the class: Name & Fun fact

- 2) Intro of discussion 5 min
 - Go over syllabus – bring extra copies to handout
 - Highlight syllabus: learning objectives, how they'll achieve them, assessments

- 3) Intro Delta project 5 min
 - Explain some places for improvement with discussion/reading comprehension last semester
 - Explain what changes will be made this semester to try to improve:
 - explicitly teaching reading strategies & using guided reading handouts
 - Explain what I want them to learn & why, how we're going to learn it, and what they'll do with it
 - o Do you ever think – "I read that, but I couldn't tell you what it was about."
 - o Or "I read that, but I don't get it."
 - o I'd like to discuss with you a number of reading strategies that are really helpful (to me and to other successful readers) in increasing how much understanding you get out a text.
 - o Readers practiced with reading scientific literature (and other types of texts) do these things automatically.
 - o I imagine many of you use reading strategies whether unconsciously or consciously. So we're going to develop those strategies to make your reading more effective and efficient. And you'll be able to use them outside of this class and especially with non-fiction readings.

- 4) Discuss reading strategies we'll use & model explicitly 10 min
 - Reading strategies I'll model explicitly**
 - Preview framework
 - Highlighting
 - Annotating (also includes skills of note taking, asking questions, making predictions)
 - Reading strategies we use in Discussion sections** (so students know why we do what we do)
 - Summarizing
 - Using graphic organizers
 - Group discussion
 - Hand out sheet with strategies on it (Everyone gets a copy to keep)
 - Explain that I'll go over the strategies by reading the sheet and by demonstrating them on an actual paper – our first paper to read for next week
 - Read over strategies, what they are, why they are useful
 - Hand out *Allen & Clarke 2005* article (Everyone gets a copy to keep)
 - I read it aloud and use the strategies noting what I used & why on transparencies

- 5) Group practice of strategies 10 min
 - o In pairs or groups of three, have them work on using the skills while reading the discussion (annotating, highlight, notes, questions, predictions)
 - write these skills on the board
 - o If time, share as a class. What were the main messages? What questions did you have?

- 6) Other examples of readings we'll have 2 min
 - o We just used these strategies with a typical paper format.
 - o We will encounter other formats this semester (brief communication & review) this semester
 - If time, ask them how can you adjust strategies to work for these formats?

- 7) Ask the class what our goals were for today and how we met them 3 min

For next week: Finish reading Allen & Clarke 2005, Complete guided reading handout with sections for your questions and summaries – online

Curriculum Vitae

Alycia C. Reynolds Lackey

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acreynolds@wisc.edu ▪ (608) 262-4437

EDUCATION

University of Wisconsin at Madison
Ph.D. Zoology, Minor in Statistics, May 2012
Graduate GPA: 4.00

University of North Carolina at Chapel Hill
B.S. in Biology, Minor in Chemistry, May 2006
Undergraduate GPA: 3.67
Biology GPA: 3.63

RESEARCH EXPERIENCE

Independent Research Project, UW-Madison, Spring-Summer 2009

- Tested the role of ecology in shaping sexual selection via male competition and female choice in laboratory experiments.

Independent Research Project, UW-Madison, Spring-Summer 2008

- Tested whether sexual isolation was lost in a pair of threespine stickleback species in laboratory experiments.

Research Assistant, UW-Madison, Spring-Summer 2007

- Responsible for collecting and managing data for extensive laboratory and field projects

TEACHING EXPERIENCE

Teaching Assistant, UW-Madison, Fall 2006, Fall 2007-Spring 2009

- Discussion TA for Human and Animal Relationships (1 semester: Spring 2009)
 - Developed and implemented reading and writing workshops to improve student achievement of course learning goals
 - Facilitated weekly discussions and invited speakers from the community
 - Led review sessions and developed exam questions
- Discussion TA for Evolution of Behavior (2 semesters: Fall 2008, 2007)
 - Facilitated five weekly discussions on primary literature articles in evolutionary behavior, led review sessions, developed exam questions
- Laboratory TA for Introductory Biology (2 semesters: Spring 2008, Fall 2006)
 - Led three weekly labs with hands-on and critical thinking and writing activities

Delta Certificate Program Participant, UW-Madison, Spring 2008 – present

- Defense of Teaching Portfolio (Summer 2009)
 - Delta Intern (Fall 2008)
 - Developed, implemented, and assessed a teaching-as-research project in connection with discussion sections of the course Evolution of Behavior
 - Participated in the course Research Mentor Training (Summer 2008)
 - Completed two graduate courses on teaching and learning (Spring 2008)
 - Courses: Informal Science Education and Diversity in the College Classroom
- The Delta Program for Research, Teaching and Learning: <http://www.delta.wisc.edu/>*

MENTORING & OUTREACH

Research Mentor, UW-Madison, Spring-Summer 2007, 2008, 2009

- Trained and supervised a total of eight undergraduates in experiment development, management and analysis

Darwin Day Presenter, UW-Madison, Spring 2007, 2008, 2009

- Designed and presented an informative and interactive display for the general public attending Darwin Day events

Expanding Your Horizons Conference Presenter, UW-Madison, Nov. 2008

- Co-led presentation on animal behavior for three groups of 12 middle school girls with aspiring interests in science, engineering and math

Research Shadowing Mentor, UW-Madison, Spring 2007, 2008

- Muhlenberg Shadowing Program (Spring 2008)
 - Developed a full-day shadowing experience for a student at a small liberal arts college to provide information and advice about the graduate school application process, life as a graduate student, and career options in science
- Ways of Knowing Biology Course (Spring 2007 and 2008)
 - Met with one student each spring to discuss student's career goals and provide insight into life as a graduate student and researcher

PUBLICATIONS

Lackey, A.C.R. and J.W. Boughman. Collapse of ecological speciation: the breakdown of premating isolation in a pair of threespine stickleback fish species (*Gasterosteus* spp.). *in preparation*

Pfennig K.S., A.J. Chunco and A.C.R. Lackey. 2007. Ecological selection and hybrid fitness: hybrids succeed on parental resources. *Evolutionary Ecology Research* **9**: 341-354.

Reynolds, A. 2006. Ecological consequences of hybridization in two species of spadefoot toads. Honors Thesis, University of North Carolina at Chapel Hill.

GRANTS & AWARDS

Emlen Fund, UW-Madison, Summer 2009

"The role of ecological change in the breakdown of reproductive isolation in a threespine stickleback species pair (Gasterosteus spp.)", \$5500

John Jefferson David Travel Awards, UW-Madison, Summer 2009

Emlen Fund, UW-Madison, Summer 2008

“Ecological speciation in reverse: the breakdown of reproductive isolation in a threespine stickleback species pair (Gasterosteus spp.)”, \$4500

REFERENCES

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