Bacteriophages Bringing Research into the Classroom – Brandl, et al.

Appendix B. Graduate Course Syllabi

Fall 2017 Online Course Syllabus

Course Timeline: August 21- December 13, 2017

Course Instructors

Rayelynn Brandl (Connole)

Office: 003 HSB

Email: rbrandl@mtech.edu

Phone: 406-496-4898

Please note that not all instructors will participate online at the same time. Each instructor is available for individual help. Please

Marisa Pedulla, Ph.D.

Office: 214 CBB

Email: mpedulla@mtech.edu

Phone: 406-496-4836

Textbooks

National Research Council. (2012). *A framework of K-12 science education: practices, cross-cutting concepts, and core ideas.* Washington, DC: The National Academies Press.

ISBN: 978-0-309-21742-2

http://www.nap.edu/catalog/13165/a-framework-for-k-12-science-education-practices-crosscutting-concepts

Summers, W. (1999). *Felix d'Herelle and the origins of microbiology*. New Haven, CT: Yale University Press.

ISBN-13: 978-0300071276

ISBN-10: 0300071272

Course Objectives

During the summer academy, teachers completed multiple experiments designed to begin answering one of the following questions:

1) BIOMEDICAL: Can we discover a mycobacteriophage or organism that inhibits
2)
3) the growth of *Mycobacterium smegmatis* from local environments?
4) ECOLOGICAL: Can we determine differences in microbial populations between damage and restored natural areas?

Teachers immersed themselves in the research practices and spent time reflecting upon how research could be conducted in the classroom and applied to their particular content. The online course is designed to help teachers develop stronger content knowledge about bacteriophages, and also intended to help teachers deepen conceptual understanding about how research is conducted. These aims will be achieved through the use of book resources, teacher reflection pieces, and weekly discussion boards.

Overall course objectives are:

1) Increase teachers' content knowledge regarding phage biology.
2) Increase teachers' content knowledge regarding bacterial evolution and antibiotic resistance.
3) Increase teachers' understanding of the K-12 Framework for Science Education.
4) Increase teachers' ability to incorporate the Next Generation Science Standards within their current classroom practice.
5) Empower teachers to design and carry out an authentic research project.

Course Norms and Expectations

- Weekly Assignments will be posted (open) on Wednesdays prior.
- Discussions begin on Mondays and complete on Wednesday. You are required to post your initial response on Monday no later than midnight (12am). You should reply to at least one other student by Tuesday at

midnight (12am). The instructors will read and comment no later than Tuesday at midnight (12am). Please post final thoughts for the discussion on Wednesday and be sure to read through the Wednesday discussion summary.

- The weekly reflection paper will be 1-2 double-spaced pages and should follow APA format/citation guidelines. Instructors may give feedback about citation to inform you, but papers will not be graded on APA formatting. You will need to master APA formatting for your final research paper (year 2). These reflection papers should be considered practice for the research paper.
- Weekly reflection papers are due on Fridays no later than midnight (12am).
- The course instructor will review reflection papers and have them returned with feedback no later than Tuesday at midnight (12am).

This course is graded in order to meet the guidelines for the graduate council. However, the expectations of the instructors are simply that each of you are giving the course due attention to learn the material, attempt new pedagogical approaches, and share quality dialogue with each other. We expect that each of you will exceed our standards and expectations for your reflections and the discussion area. We expect that each of you will easily earn the maximum points available for each activity. The points are simply to track that each person has completed the assignments to his/her best effort. If you are struggling to complete an assignment or discussion, please email Rayelynn Brandl to make arrangements. We can extend time if needed. Nothing should be too overwhelming to complete.

Point Structure:

Discussion Participation: **10 points per week**

Reflection Papers: **20 points per week**

- ✓ Points are awarded when your paper with comments is returned by the instructor.

Research Project Draft: **50 points**

- ✓ Points are awarded when your draft is submitted to the instructors.

Total Points: **510 points possible**

Grading:

Grade	Percent of 510 total points
A	94-100
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D+	67-69
D	64-66
D-	60-63
F	Less than 60

Week 1 August 20th-26th: Orientation to online learning

- ✓ Profiles and Discussion Forum
- ✓ Course Treasure Hunt

Week 2 August 27th-September 2nd Felix d'Herelle

- ✓ Chapter 1-3
- ✓ Weekly Discussion Forum
- ✓ Reflection

Week 3 September 3rd –September 9th Felix d'Herelle

- ✓ Chapters 4 and 6 (chapter 5 is optional)
- ✓ Weekly Discussion Forum
  - Research Question Ideas
- ✓ Reflection
- ✓ K-12 Framework begins—pp.1-7 and pp.23-29
  - The guiding principles of the Framework will be examined alongside of the reading. We will examine d'Herelle's process and ask ourselves, did the writers of the Framework capture the essence of what it is to be a scientist?

Week 4 September 10th –September 16th Framework Practices

- ✓ Chapter 3 of the Framework Book pp. 41-58
- ✓ Weekly Discussion Forum
  - Background Research—Where do I look? How do I begin?
- ✓ Reflection—How to read research papers
- ✓ Research Question Idea Assignment Due
  - What is your research question? **How can I narrow my question to be testable?**
- ✓ Look ahead to Week 5. We will try a lesson based on the practice of *Asking Questions and Defining Problems* in the classroom next week. You are welcome to use the sample lesson provided in the course or make up your own activity to engage students in asking questions.

Week 5 September 17th – September 23rd Framework and the Classroom

- ✓ K-12 Framework Practices pp. 59-79
- ✓ Weekly Discussion Forum
  - Bring together the past few weeks. Relevancy and personal ownership of learning
- ✓ Practices in the Classroom—*Asking Questions and Defining Problems* lesson

Week 6 September 24th –September 30th Phage Papers

- ✓ Phage Papers
- ✓ Weekly Discussion
  - During this week, please post questions you have about phages as we complete our readings.
  - Discussion about last week's lesson—how did it go?
- ✓ Reflections
- ✓ Assignment: Find a quality bacteriophage resource for educators and post to discussion forum

Week 7 October 1st –October 7th Planning the Research

- ✓ Weekly Discussion
  - Discussion will tie back to Framework Practice of *Analyzing and Interpreting Data.* As you plan your project, knowing what data you will collect and how you plan to use that data is important.
- ✓ Reflections
- ✓ Assignment: Bibliography of background resources you have collected so far

Week 8 October 8th –October 14th Evolution of Bacteria

- ✓ Antibiotic Resistance papers
- ✓ Weekly Discussion
  - How do we facilitate our students' ability to be discerning with science materials?
- ✓ Brainstorming Discussion Forum for methods
  - Help each other consider ways to complete research questions
  - Let us know if you are presenting at MEA/MFT

Week 9 October 15th-October 21st MEA/MFT Week

- ✓ Readings Only—Background Research

- ✓ OPTIONAL reflection on something you learned at MEA→ Share with colleagues on discussion board
- ✓ Begin Drafts of the Project Plan

Week 10 October 22nd- October 28th Science Literacy

- ✓ NGSS, Nature of Science, and Science Literacy Standards
- ✓ Weekly Discussions
  - Given the need for scientifically literate students, how do we approach teaching science literacy?
- ✓ Weekly Discussions
  - Update on your personal research projects. Have you changed plans since getting into the background and starting to plan the project?
- ✓ Reflections

Week 11 October 29th – November 4th Practices in the Classroom

- ✓ Framework Chapter 10 pp. 246-257.
- ✓ Lesson Drafts
  - You will create a lesson that incorporates a Practice, a Cross-cutting Concept, and your particular Disciplinary Core Idea, in other words, a 3-d lesson. This week your draft for this lesson is due Friday rather than a reflection paper.
- ✓ **Prepare a 3-d Trial lesson for the classroom that you will deliver either week 13 or 14**

Week 12 November 12th- November 18th Science Practices and the Classroom

- ✓ Weekly Discussions
  - Feedback on 3-d lessons
- ✓ Draft ideas for personal research
  - Tighten up the research question… is your question testable?
  - Begin to develop hypothesis statements

- Draft bibliography due—for this assignment, you will simply submit what articles and items you have looked at so far. This is not a complete bibliography and will not be 'graded'. The bibliography will be reviewed by the instructors in order to help guide you.

✓ No Wednesday Discussion Summary

Week 13 November 12- November 18th Developing 3-d Lessons

✓ **Planning your 3-d Trial Lesson**

✓ Weekly Discussions—**Share your lesson ideas with the group and please give feedback to others.**

Week 13 November 19th- November 25th Thanksgiving Week

✓ **Trial Lesson in the Classroom**

- **Please try your 3-d lesson in the classroom either this week or next, whichever works best for you.**

✓ **No Discussion this week**

✓ Thinking ahead to your project

- Planning to collect data
- Timeline—is it workable?
- What support/materials/supplies do you think you may need?

Week 14 November 26th- December 2nd 3-d Lessons

✓ Trial **lesson in the Classroom**

✓ Lesson Reflection Paper due by **Monday, December 4th.**

✓ Weekly Discussions—OPTIONAL to share how your lessons went if not done previous week

✓ Continue with research plans

Week 15 December 3- December 9th Finalizing Plans and Feedback

✓ Discussion Forum

- Questions/Concerns, ideas for the summer, thoughts about how the classroom visits went this year.
- Share drafts of research projects with each other and provide feedback

- ✓ Course evaluations

Finals Week December 7th- 13th

- ✓ **Research Plan DUE no later than Thursday, December 14th**
  - This is a preliminary draft plan for your research project. It will be reviewed by the instructors to determine feasibility of pursuing the research question you propose. You may change and deviate from this plan as you progress through data collection. Please keep in touch with Dr. Pedulla and Rayelynn Brandl regarding changes so we can support you.
  - Comments and feedback will be returned via email no later than Dec. 30th.
- ✓ **Reminder that you will be collecting data through the spring and at the next academy.**

Other Information

For students with Disabilities

Students with disabilities who may need accommodations in this class should contact a Montana Tech Disability Coordinator (X4429) for a letter authorizing the necessary accommodations and make an appointment to see me.

Montana Tech CHEATING/PLAIGARISM POLICY:

Montana Tech ACADEMIC DISHONESTY: The following will be considered acts of academic dishonesty or cheating:

1. **Plagiarism.** A student will be considered guilty of academic dishonesty, if: a student submits a term paper, essay, speech, laboratory report, or other assignment, in which all or part of the words or ideas are copied from the published or unpublished work of another individual without giving the original author proper credit for the words or ideas.

2. **Copying from the paper of another student while taking an examination.** A student will be considered guilty of academic dishonesty if he or she deliberately looks at and copies from another individual' s examination paper during an examination.

3. **Using unlawful aids to pass an examination.** A student will be considered guilty of academic dishonesty if he or she brings to class and uses crib notes, books, or any other material to assist him or her in passing the examination unless the instructor of the class has specifically given permission to use such materials.

4. **Aiding another student.** A student will be considered guilty of academic dishonesty if he or she willfully assists another student in any act of academic dishonesty. Such a person is equally guilty as the person plagiarizing or copying.

5. **Unauthorized Signatures:** The use of a person' s signature without permission is a serious matter and the consequences can be severe. Possible consequences include:• Being dropped from the course by the instructor, department chair, dean of the college, or the University.• Loss of tuition paid for the course.• University disciplinary action such as probation, suspension, expulsion, and correction of all course grades.• Loss of priority for the course or courses during registration. The above applies to all documents used by Montana Tech that may require a signature.

Actions to be taken when cheating is discovered are as follows:

1. Instructors are responsible for taking reasonable precautions to prevent and discourage cheating in their classes and must report all cases to the Vice Chancellor for Academic Affairs Office.

2. If it is determined that a student is deliberately cheating on an examination or a written or oral assignment, he or she should receive a grade of "F" on that examination or assignment as a minimum penalty. The instructor may drop the student from the course with an "F" grade.

3. In reported cases of repeated cheating, the Academic Standards Committee may consider applying additional penalties beyond those imposed by the individual instructors, including expulsion.

Any student who thinks that he or she has received unfair treatment in regards to cheating should request a hearing with the Disciplinary Appeals Committee not later than one school week after notification of the action taken by the instructor or by the Academic Standards Committee.

Bringing Research Into the Classroom

Fall 2018 Online Course Syllabus
BIOL 591 Phage Biology for Teachers II

Course Timeline: August 27- December 14, 2018

Course Instructors

Rayelynn Brandl

Office: 003 HSB

Email: rbrandl@mtech.edu

Phone: 406-496-4898

Arlene Alvarado, Ph.D.

Office: 003 HSB

Email: aalvarado@mtech.edu

Phone: 406-496-4833

Marisa Pedulla, Ph.D.

Office: 214 CBB

Email: mpedulla@mtech.edu

Phone: 406-496-4836

Please note that not all instructors will participate online at the same time. Each instructor is available for individual help. Please email or call to set up an appointment.

Course Objectives

Overall BRIC program objectives are:

6) Increase teachers' content knowledge regarding phage biology.
7) Increase teachers' content knowledge regarding bacterial evolution and antibiotic resistance.
8) Deepen understanding about the Nature of Science and science literacy.
9) Increase teachers' understanding of the K-12 Framework for Science Education.
10) Increase teachers' ability to incorporate the Next Generation Science Standards within their current classroom practice.
11) Empower teachers to incorporate authentic research experiences for their students within their typical classroom time.
12) **For Fall Semester 2018, the online course will focus on writing the research paper.**

Course Norms and Expectations

- One live, synchronous course meeting will be held in order to prepare students for planning their paper writing. This meeting is mandatory and will be awarded points for attending.
- The course schedule will walk through the individual sections of a typical paper. Sections will be due on the following Friday of the assigned week.
- The course instructor will review submitted sections and have them returned with feedback no later than Tuesday am.
- In order to help facilitate background research completion, you will review and submit a synopsis of two background articles. The synopsis will be shared on the discussion board with your peers.
- The discussion board will be periodic and is intended to keep the momentum of the course and can be used to support one another with resources, etc. The discussion section is only graded on weeks where there is a specific assignment such as a synopsis or professional practice reflection.
- You will complete a peer review of your colleagues' papers. The instructors will award 10 points for completing the reviews and each of your colleagues will award 5 points (using a rubric) for the quality of your review. Please be diligent with your reviews and give high-quality feedback. We will cover this aspect in detail during the first week of the course.
- The expectations of the instructors are that each of you are giving the course due attention to learn the material, attempt new pedagogical approaches, and share quality dialogue with each other. We expect that each of you will exceed our standards and expectations for your reflections and the discussion area. We expect that each of you will easily earn the maximum points available for each activity. The points are simply to track that each person has completed the assignments to his/her best effort. If you are struggling to complete an assignment, please email Rayelynn Brandl to make arrangements. We can extend time if needed. Nothing should be too overwhelming to complete.

Point Structure:

Weekly assignments (drafts):

- ✓ **Discussion Board if there is one that week (10 points)**
- ✓ **Completed draft sections (10 points)**

Synopsis Papers: 20 points each paper

Peer Review: 20 points

Final Paper: **200 points**

Total Points: 340

Grading:

Grade	Percent of 340 total points
A	94-100
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D+	67-69
D	64-66
D-	60-63
F	Less than 60

Week 1 August 27th to September 1: Organization Week

- ✓ Discussion board: Background Research Resources—What is your go-to for looking up articles? (10 pts)
- ✓ Instructions for Tech students, using library online sources.

Week 2 September 3: Identify background resources

- ✓ Use discussion board to share resources that you like for writing (10 pts)
- ✓ Systems for reference building—word, online programs, etc
- ✓ Review materials listed in course
  - Final Paper Template
  - Connections to Classroom/NGSS and Authentic Research
- ✓ Identify at least 2 background articles for first synopsis assignment due Sept. 21st

Week 3 September 10th: Resource Sharing and Needs

- ✓ Continue to gather your bibliography items (look over any and all resources you have used for your project to date)
- ✓ Review APA style requirements (OWL)
- ✓ Draft outline of paper due on **September 14th**

Week 4 September 17th: Project Planning Video Conference

- ✓ **Draft Outline Due September 14th (10 pts)**
- ✓ Mandatory live video conference with Marisa on September 15th (10 pts)
- ✓ Use discussion board if needed to help one another
- ✓ Begin materials and methods section draft

Week 5 September 24th: Materials and Methods

- ✓ Materials and Methods section due **Friday, October 5th**
- ✓ Upload background article and synopsis to discussion board by September 25th (20Pts)
    - Review synopses and leave comment in areas that may be useful for your paper

Week 6 October 1st: Begin Background/Literature Review Section

- ✓ Methods and Materials sections due **Friday, October 5th (10 pts)**
    - Instructors will return with comments by October 9th
- ✓ Identify synopsis paper 2 for next week
- ✓ Outline of background section is due **Friday, October 12th**
    - This is the outline you will utilize for writing your final draft of the background section
- ✓ If there are any significant revisions needed of methods and materials, you may be asked to re-submit that section

Week 7 October 8th: Background/Lit Review with Citations

- ✓ Background section with citations is due **Friday, October 12th**.
    - The citations will eventually be fit into your overall bibliography but need to be included here
- ✓ Second synopsis paper due to discussion board by **October 9th (20 pts)**
    - Review synopses and leave comment in areas that may be useful for your paper

Week 8 October 15th: Revisions Week/Convention Week

- ✓ Background sections with citations will be returned by instructors with comments by **October 16th**
- ✓ Review and revise background section
- ✓ Add or delete any citations for background section
    - You may be asked to re-submit background section, otherwise nothing due this week.

Week 9 October 22nd: Results

- ✓ NOTE: If you are still working and collecting data, please email Rayelynn Brandl for alternative timeline.
- ✓ Draft of Results section due **November 2nd.**
- ✓ Construct data tables and figures this week.
- ✓ Check into discussion board: Take a pulse? How are we doing? (10pts)
    - Instructors will monitor discussion board for questions, needs, etc. Please plan to check the board throughout the week

Week 10 October 29th: Discussion Section

- ✓ **Results draft due November 2nd (10 pts)**
- ✓ Begin discussion section
- ✓ Draft discussion section due **November 9th.**

Week 11 November 5th: Abstract and Literature Cited

- ✓ Discussion section due November 9th. Instructors will return by November 13th. (10pts)
- ✓ Draft Title Page, Abstract and Literature Cited
- ✓ Look ahead → Draft of complete paper for peer review is due November 19th

Week 12 November 12th: Pulling It Together

- ✓ All sections compiled together—Complete Draft due for peer **review November 19th (10pts)**
    - Be sure to review APA formatting requirements
    - Rayelynn will disburse papers for peer review

Week 13 November 19h: Peer Review Begins (Thanksgiving Week)

- ✓ **Please return peer reviewed papers to BOTH the individual student and Rayelynn Brandl (20 pts)**

Week 14 November 26th: Revisions Week

- ✓ Peer review rubrics submitted by November 30th
- ✓ Complete revisions
- ✓ Discussion Reflection: Discuss challenges, opportunities, ideas, methods for completing authentic research in your classroom. Please make comments on colleagues 'posts. This discussion will end on **December 7th.** (10 pts)

Week 15 December 3rd: Revisions Week

- ✓ Final papers are due December 11th by 5:00pm.
  - Please note, if you need help or would like a second edit of your paper, this is the week to request review by instructors.

Finals Week December 10th

- ✓ Final papers are due December 11th by 5:00pm. (300 pts)

Other Information

For students with Disabilities

Students with disabilities who may need accommodations in this class should contact a Montana Tech Disability Coordinator (X4429) for a letter authorizing the necessary accommodations and make an appointment to see me.

Montana Tech CHEATING/PLAIGARISM POLICY:

Montana Tech ACADEMIC DISHONESTY: The following will be considered acts of academic dishonesty or cheating:

1. **Plagiarism.** A student will be considered guilty of academic dishonesty, if: a student submits a term paper, essay, speech, laboratory report, or other assignment, in which all or part of the words or ideas are copied from the published or unpublished work of another individual without giving the original author proper credit for the words or ideas.

2. **Copying from the paper of another student while taking an examination.** A student will be considered guilty of academic dishonesty if he or she deliberately looks at and copies from another individual' s examination paper during an examination.

3. **Using unlawful aids to pass an examination.** A student will be considered guilty of academic dishonesty if he or she brings to class and uses crib notes, books, or any other material to assist him or her in passing the examination unless the instructor of the class has specifically given permission to use such materials.

4. **Aiding another student.** A student will be considered guilty of academic dishonesty if he or she willfully assists another student in any act of academic dishonesty. Such a person is equally guilty as the person plagiarizing or copying.

5. **Unauthorized Signatures:** The use of a person' s signature without permission is a serious matter and the consequences can be severe. Possible consequences include:• Being dropped from the course by the instructor, department chair, dean of the college, or the University.• Loss of tuition paid for the course.• University disciplinary action such as probation, suspension, expulsion, and correction of all course grades.• Loss of priority for the course or courses during registration. The above applies to all documents used by Montana Tech that may require a signature.

Actions to be taken when cheating is discovered are as follows:

1. Instructors are responsible for taking reasonable precautions to prevent and discourage cheating in their classes and must report all cases to the Vice Chancellor for Academic Affairs Office.

2. If it is determined that a student is deliberately cheating on an examination or a written or oral assignment, he or she should receive a grade of "F" on that examination or assignment as a minimum penalty. The instructor may drop the student from the course with an "F" grade.

3. In reported cases of repeated cheating, the Academic Standards Committee may consider applying additional penalties beyond those imposed by the individual instructors, including expulsion.

Any student who thinks that he or she has received unfair treatment in regards to cheating should request a hearing with the Disciplinary Appeals Committee not later than one school week after notification of the action taken by the instructor or by the Academic Standards Committee.