

Cross-Course Public Health Project on Infectious Disease

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Abstract

The need for collaborative, public health education has never been more important. Students increasingly require necessary skills in effectively communicating critical information to the general public and in working strategically in interdisciplinary project development. Project-based learning is a dynamic pedagogical approach to accomplish these goals and develop powerful engagement among students and a motivation to learn. This presented project involves a collaboration between first-year Microbiology students and senior-year Public Health Nursing students. First-year students work in teams to analyze data and create public health education for an assigned infectious disease. The teams develop a brochure and a corresponding website for the public. Senior-year students offer critique and direction for improvement not only on the key messages but also on the appropriateness of the delivery for the audience. This project involves active learning, assessment skills, and inclusive teaching. In the era of COVID, this infectious disease project is timely, relevant, and student-centered. As the COVID-19 pandemic has illustrated, multiple factors must be considered to create successful public health education campaigns. The authors discuss ideas to expand the project to address sociocultural group influence on decision-making.

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Learning Goals

At the end of this lesson, first-year students will:

- ◊ value communication to a lay audience.
- ◊ understand barriers to obtaining healthcare.
- ◊ understand the biology of a specific microbe that causes a specific disease.
- ◊ understand the spread and prevention of infectious disease.
- ◊ know how antimicrobial drugs work.
- ◊ recognize high quality sources of information.
- ◊ become familiar with some basic computer skills.

At the end of this lesson, senior students will:

- ◊ understand the importance of using credible websites.
- ◊ understand how to determine readability levels of documents.
- ◊ recognize personal growth and knowledge from freshman to senior year.
- ◊ become familiar with how to critique health information for effectiveness in communicating messages to a targeted audience.

Learning Objectives

At the end of this lesson, first-year students will be able to:

- ◊ match an appropriate target audience with a specific disease.
- ◊ write accurate scientific information for a public (non-expert) audience.
- ◊ describe the structure and function of a specific bacterium or virus.
- ◊ describe the epidemiology and prevention of a specific infectious disease.
- ◊ describe the mechanism of action for drugs used to treat a specific infection.
- ◊ correctly cite sources of scientific information.
- ◊ use Microsoft Word, Adobe Acrobat, and Google sites.

At the end of this lesson, first-year students will be able to:

- ◊ critique the accuracy of content on infectious disease.
- ◊ critique health education materials for health literacy.
- ◊ convey a critique in a professional and useful manner.
- ◊ use Microsoft Word to obtain readability scores.

INTRODUCTION

We have seen over the course of the COVID-19 pandemic just how critical science communication is to our public health and what dire consequences its absence may cause (1). Public health communication has been defined as the art and technique of informing, influencing, and motivating individual, institutional, and public audiences about important health issues (2). Since this involves experts understanding, aggregating, and presenting information to an outside audience, it is inherently transdisciplinary in nature (3) and requires an audience-centered approach, understanding the power of sociocultural values on decision-making (4). In the microcosm of the classroom, research suggests that learning is improved when students feel course content is relevant to real-world applications (5). So, to align the need for public health communication skills and a motivation to learn microbiology concepts, we developed a collaborative project between first-year nursing Microbiology and senior-year Public Health Nursing courses. In the project, first-year students work in small groups to produce a “public service announcement” style brochure that educates a non-expert audience about a relevant infectious disease. The brochure contains, among other information, a clear take-home message that is appropriate for its audience and a link to a student-made website with more detailed information. Students then present their brochure and websites to the class. At multiple steps of the creative process, senior Public Health Nursing students provide critical feedback to the first year students. The senior students assess the work for accuracy, health literacy, and readability. This collaboration culminates in the seniors participating in the audience of the final presentation, and awarding a small prize for the “best” project.

The lesson described here makes use of the powerful pedagogical approach of project-based learning. Project-based learning has been shown to enhance student learning, improve communication and negotiating skills needed for working in groups, and motivate students to become engaged in learning. Additionally, the realistic and applicable nature of problem-based learning increases skills that will help in the job market. Interdisciplinary group projects, in this case crossing the lines of public health, infectious disease, and nursing, leverage socially-interactive learning to push students toward higher order thinking and more substantive connections between content areas (6–8). While fully converting a class to project-based pedagogy might not be feasible, the specific project described here provides some of the same structural elements and perhaps the same benefits, without the need for additional institutional resources.

Intended Audience

The lesson has been taught in the context of a medium-sized (40–50 students) microbiology course for first year nursing majors and paired with an upper-level public health nursing course. It is intended primarily for introductory college microbiology students who intend to be nurses. The lesson could be adapted to a non-majors audience.

Required Learning Time

The required learning time ranges from 4–15 weeks depending on the intensity with which you want to devote

to the project. A longer timeline allows for students to learn a concept and then apply it to the project immediately. A shorter, delayed timeline allows students to learn all of the foundational concepts first, and then apply them in a holistic way. We have taught it spread throughout a semester and also as an intensive 4 week section at the end. Here we will describe the timeline for a 4 week project at the end of a semester since we have found this to be the most satisfying experience for both us and the students.

Prerequisite Student Knowledge

First-year students should have an advanced high school or introductory college level understanding of microbiology, with the commensurate experience with introductory biology and chemistry concepts. This should include bacterial and viral structure, function and genetics, including central dogma. Students should have had an introduction to the functional classes of antibiotics and vaccines. Our first-year students have had one semester of Anatomy & Physiology, one semester of Introductory Chemistry, and we use the textbook *Microbiology Fundamentals: A Clinical Approach* by Cowan and Smith for this course. Students are expected to understand microbiology concepts at this introductory level. Senior students should have completed the class module on epidemiology. Senior students should have a basic knowledge of health promotion and health education concepts. While these items have been helpful for our implementation, fewer required prerequisites would also be acceptable if tailoring the lesson to a non-majors audience.

Prerequisite Teacher Knowledge

Both instructors should have a working knowledge of microbiology, basic immunology, infectious disease, antimicrobial drugs, and vaccines. Both instructors should also have a general sense of the social determinants of health, cultural competence in health education, and the sociocultural aspects of decision-making. A suggested course expansion related to these topics is at the end of this article. The collaborating instructor should have a working knowledge of health promotion and health education principles. Instructors should also be comfortable with Microsoft Word, Google Drive, Adobe Acrobat, and Google sites.

SCIENTIFIC TEACHING THEMES

Active Learning

First year nursing students will actively engage with microbiology concepts by gathering, integrating, and evaluating information from a variety of sources. Further, they synthesize this information into something new by designing, composing, and producing the brochure and website products. Students then analyze and compare the projects from other groups, providing peer feedback. Finally, students must explain and discuss the concepts in their project during an oral presentation. Each step requires students to be active participants in their learning as they are the ones creating, critiquing, and presenting the work. Senior nursing students have completed this assignment as freshmen. They recognize their growth, both in maturity and in knowledge. Senior students actively review sources and content, offering a professional critique of the work. Additionally, they understand readability levels and how to assess health education for readability. Both first year and

senior students' engagement is "real," organic, and inspiring since the content and outcome process of developing of each assignment is dynamic and creative.

Assessment

Assessment is tiered with generally increasing weight and complexity. They are, in order of administration to the first-year students: topic summary, draft brochure and webpage, peer team review, final brochure and webpage, oral presentation. All assessments are guided by evaluation rubrics that are shared with the students with the assignment instructions. Students are able to evaluate their own learning through written and oral feedback I provide as well as critique from their classmates. Because the process is incremental, students have ample time to receive assessment and adjust before the next part of the project is due. Evaluation of student performance can be calibrated to the level concepts and vocabulary used in the course textbook (for us, *Microbiology Fundamentals: A Clinical Approach* by Cowan and Smith). The instructor has considerable flexibility here. Have the students internalized the core concepts presented as evidenced by their writing and speaking? Have the students shown an ability to adjust and improve upon receiving critical feedback? What constitutes an excellent evaluation will necessarily depend on the audience, and I would encourage instructors to reflect on what that means for their particular class. Senior nursing students are graded based on a rubric that entails credible sources utilized, depth of critique, and completeness of criteria.

Inclusive Teaching

Inclusive teaching can be defined as intellectual and affective approaches that generate equal opportunities for students to successfully construct knowledge in their discipline, and therefore learn (9–11). This project leverages several approaches to further inclusion in the classroom. First, the multimodal nature of the project means that students can contribute to the creative process and end product in varied ways that align with their strengths. For example writing, reading, drawing, designing, and speaking are all needed for project success. The delegation of tasks is flexible and decided within each group based on the unique combination of individuals participating. Second, project work is organized into intra-class groups and inter-class pairings with seniors as well. This means students work with others at the same point in their nursing degree and also have contact with senior nursing students who have themselves become experts in their discipline. Several opportunities arise with this configuration to practice dialog across differences. Students must plan, communicate, and execute a multifaceted and multi-week project with people different from themselves. The instructor can guide students in reflecting on A Few Essentials of Good Teamwork (Supporting File S3) to help them grow in their ability to be inclusive themselves. Further, students' decisions on the content of the project can bring up important dialog about difference: target audience, information to include in the project for that audience, and the design of the product (including pictures) are more complex than they might initially seem. For example, what about United States history might lead some audiences to be more hesitant than others to access healthcare? Who will be represented visually in the brochure and website and could this influence a reader's reception

of the information you wish to convey? What assumptions about gender roles and caregiving might be unconsciously communicated by the language chosen to be used? Seniors, with their new expertise in public health nursing, along with the instructors, can help broker these conversations through their feedback. We encourage other instructors to look for additional opportunities to view this project through the lens of inclusion and ensure it is situated in an inclusive classroom environment.

LESSON PLAN

The bulk of the following lesson plan description focuses on the first-year microbiology course (Table 1). Where relevant, however, lesson details for the senior public health course are included (Table 2). These notes are marked with the phrase "Senior Class Component" and can be omitted if running the project without a senior course partner. A summary of lesson components and their intended use can be found in Supporting File S12. The activities for some of the class days below will fill an entire class period, while others may only take a small portion. It is entirely up to the instructor to decide how much additional in-class work time is offered to either fill out class time or not.

Preparation for Project Day 1 – First Year Course

The first year, this preparation will likely take several hours, however much of what is done here (learning how to use Google Sites, creating the disease topic handouts) will be much faster in subsequent years. After several years of teaching this project, it takes me 1–2 hours to complete these tasks.

Form Project Groups

Students will work in these groups for the entirety of the project so some time and thought should be put into their formation. Groups can be student selected, randomly assigned, or non-randomly assigned by the instructor. If the instructor selects groups, alternate approaches can be considered. There is some evidence to suggest that work in academically heterogeneous groups leads to better learning (12, 13). However, there is also evidence that academically homogeneous groups produce better outcomes (14). So, take a moment to consider what you know about each student's performance, habits, and identities from the first part of the semester to form project groupings. Examining strategic grouping resources from the Center for Professional Education of Teachers at Columbia University may be helpful as well (15). When you are satisfied with your groupings, record this.

Senior Class Component

For the senior nursing students, it is important that they work independently. This reinforces the personal responsibility to use their knowledge and critical thinking skills to assess a project for a targeted audience. In preparation of the first day, develop the assignment and rubric instructions (Supporting File S10). Also, be prepared to introduce the exemplar (Supporting File S11) so students understand the expectation. I decided not to hand out or electronically post the exemplar, as I did not want students merely copying the example. I review the document the first day of class, while sharing it will not be posted anywhere and suggesting students take notes.

Create Infectious Disease Topics and Handouts

Each group will need an infectious disease of public health importance for their project. A list of diseases that I have used, and that I think work especially well for this application, is available in Supporting File S1. I have in the past allowed students to choose their own topic, however this led to work on some diseases that did not fit well with the requirements and goals of the project. For example, acne is a popular topic but is not a critical infectious disease. So, I recommend at least providing a curated list. Once you have settled on the list of diseases, develop a worksheet that models the major areas of the project for the brochure and website. An example worksheet is available in Supporting File S2. The purpose of the worksheet is to guide the group's initial investigations. It is completed in class and used as the basis for a brief discussion. It is not graded and no credit is awarded for its completion. For some added excitement, place each worksheet in a blank envelope for students to choose from in class.

Set Up a Google Sites Website

[Google Sites](#) is a simple way to make a website. Students and faculty are often already part of the Google ecosystem because of Gmail, Google Drive, or other services, so I have adopted this platform for the project. Further, Google Sites allows you to control the level of privacy for your page. I do not actually put the website they create on the public internet. To set up a new website, follow these basic instructions:

- Go to sites.google.com and log in.
- Browse the website templates to find one that you like.
- Rename the new site for your class
- Create subpages for each disease/group
- Customize your page with pictures, colors, and fonts
- Set sharing permissions to a level you are comfortable with. In my class I make the page viewable by those with a University login and the link to the website.

You are creating a shell of a website. Students will fill in information on their own topic subpage later. Share the website with your students. There are a lot of options, so it is easiest to simply play around. Most things can be done by “drag and drop” and anything can be undone if you don’t like it.

Prepare “Essentials of Good Teamwork” Handout

Modify and print Supporting File S3.

Prepare Project Summary Assignment

Modify and print Supporting File S4.

Project Class Day 1

Prepare Students for Teamwork

Have students move into their assigned groups and hand out the “Essentials of Good Teamwork” (Supporting File S3). Go over the points made in the handout. I use this moment to remind students of the “soft skills” they are developing in college, how important they are for their future careers, and how all of their interactions are building professional relationships. These types of skills are often referenced in letters of recommendation.

Assign Diseases to Groups

Learning microbiology is challenging and this is an opportunity for some levity and excitement. Showing your enthusiasm as the instructor also helps students buy in to the work they are about to undertake. In my classroom, I place each disease worksheet into a blank envelope. Then I ask each team to come to the front of the room in turns where they must choose one of the blank envelopes, which I display for them with some showmanship. After selecting their envelope, they open it in front of the class and call out what disease/microbe they have selected. I add some color commenting on their topic to highlight why it is important and interesting. This proceeds until every group has selected their topic.

Work Time to Begin Project Research

Give students sufficient in-class time to fill in preliminary answers to the questions on the worksheet. Warn them that someone from each group will need to report out to the room at the end. The questions I ask of them for each disease are:

- [Classification] What type of organism causes this disease? (bacteria, virus, fungus, protist)
- [Signs and Symptoms] What would one experience (symptoms) and what would a clinician observe (signs) if affected?
- [Diagnosis] What would be done to diagnose this infection?
- [Treatment and Prevention] What’s a typical course of treatment? How is it prevented? Is there a vaccine?
- [Epidemiology] Who is most affected by this disease? How many people? How is the disease spread?
- [Target Audience and Take Home Message] Who would benefit most from preventing this disease? What message would you want them to take away from your project?
- [Team Planning] Have you exchanged contact info? Got a plan to get started?

When students have worked through the questions, have each group briefly describe what they have found. I use this moment to gently correct any incorrect or misleading ideas they may be forming, and praise or support good questions and thinking they may be developing as well.

Distribute and Discuss Project Summary Assignment

The next step in building their project is to begin to write about the topic and develop a clear and well-reasoned take-home message for a specific audience (Supporting File S4). For example, whooping cough is especially dangerous for young babies so pregnant mothers are recommended to receive a pertussis booster shot in the third trimester. Therefore, a specific audience for whooping cough might be pregnant women with a take home message encouraging vaccination. The project summary is short, only one paragraph, so the due date can be soon.

Preparation for Project Class Day 2

Grade Project Summaries

The summaries are short (about one paragraph) so grading shouldn’t take too long. Provide written feedback, especially about the target audience and take home message. The weight

of this assignment should be low. I set this at about 5% of the overall project grade.

Senior Class Component

Match each student with an infectious disease (multiple students may have the same disease depending on class size). Students need to be familiar with the assigned infectious disease in order to critique the first-year drafts. I suggest allowing 15–20 minutes of class time for the students to review their assigned disease and identify at least two credible websites they will use in their critique. Remind students their work must be individual and show unique thoughts and ideas. Review the questions that the students will be answering for the Step 1 critique assignment instructions and rubric (Supporting File S10). After class, I email the students the first-year paragraph they are assigned to critique. They turn in their work electronically by the due date.

Project Class Day 2

Return Project Summaries

Provide a few minutes in class for groups to look at the feedback and ask questions.

Introduce Project Draft Assignment

Students will next need to construct draft brochures and websites. In my course they are weighted to be 20% of the total project grade. This step takes the greatest amount of student time so set a due date that is appropriate to the other work going on in the class. Hand out the draft assignment with its accompanying rubrics (Supporting File S5) and go over them in detail. Logistics that I have found especially important to address are:

- Finding images that are free to use (not copyrighted)
- A description of types of quality sources—primary literature and reviews, search engines for peer-reviewed articles, acceptable government or organization websites
- An explanation of how to cite sources with APA format
- Technology options for making the brochure
- Guidance on how to write accurately but without a lot of jargon

You can provide some in class work time if you want.

Project Class Day 3

Draft project due. Students can submit their brochures to you digitally. The website is what it is, although you can remove permissions if you wish to prevent changes after the due date.

Senior Class Component

Senior students follow the instructions for Step 2 to critique the brochure and website (Supporting File S10). This work is completed outside of class time. I demonstrate how to find the readability ease and reading level using Microsoft Word in class. Instruct the students to be looking for an email with their assigned brochure and website to critique. The instructor will have to prepare the documents received from the first-year instructor and email them to the corresponding student.

Preparation for Project Class Day 4

Decide Team Peer Review Pairings

Depending on the size of the class, pair each group with 1–3 other groups to provide critical feedback on their project draft. I assign pairings based on topic (e.g., a group with a virus can review another viral project) and based on performance such that any teams that are struggling will review at least one very strong draft. This allows the struggling team to see what is possible and for the strong team to have the challenge of a more complex critique.

Print Copies of the Brochures for Each Team Review

Print in color enough copies of each brochure for the groups doing the reviews. I find having a paper copy to be easier for the students than a PDF.

Print Team Review Instructions

Modify and print Supporting File S6.

Project Class Day 4

In-Class Work Time for Peer Team Review

Move students to sit in their teams and then distribute the assignment instructions (Supporting File S6) and briefly discuss. I emphasize a couple of things. First, that the better this feedback is, the better that team will do on the assignment. Second, to put yourself in the role of teacher. What would the instructor notice about the draft? Third, always provide feedback, both positive and negative, in a constructive and professional manner. No insults, no sarcasm. The grade for the peer review will be based on the accuracy, thoroughness, and professionalism of the work. I usually weight this assignment 20% of the overall grade. Then, hand out the review pairings, providing a printed copy of the brochure, which then allows the students to access the appropriate draft webpage. Teams make a shared Google Doc to write their feedback, which is then shared with the instructor at the end of class. Allow students plenty of time for this assignment as it is one of the most valuable parts of the project. Circulate around to ask questions and challenge their thinking. When finished, remind students to share their review document with you, the instructor. If taking a longer time frame for the project overall, students could be given several days to a week for this task.

Senior Class Component

Select a small group of senior-students to attend the presentations and assist in selecting the winner. If you have a small class, the entire class may attend.

Preparation for Project Class Day 5

Assemble Senior Feedback, Peer Feedback, and Your Own Feedback Into One Packet

This is the most labor-intensive portion of the project for you as instructor. I start by reviewing and grading each brochure/website pairing using the rubric, marking scores and making notes. Then I review the senior feedback and add it to the growing packet. Finally, I review the peer feedback, grade those documents based on the criteria in the assignment, and add it to the feedback packet.

I suggest removing factually incorrect feedback from the reviews, but otherwise leave in conflicting viewpoints. There

are often multiple good directions that teams could take with their project. This provides a great teachable moment when helping students think through what to do when there isn't just one "right" answer. Create one collated feedback packet for each project group.

Finally, prepare to distribute the completed packet either digitally or print form. Ensure that students have at least a week between receiving their comprehensive feedback and when the final version is due. The instructor should feel free to allocate more time if possible.

Project Class Day 5

Return Feedback to Teams and Assign Final Presentation

Hand back the graded rubric and feedback packet to teams and allow for some in-class time for discussion and questions. Distribute and discuss the instructions for the final presentations (Supporting File S7). I usually weight the final presentation to be about 10–20% of the overall grade.

Preparation for Project Class Day 6

Collect Final Drafts

An example final brochure can be found in Supporting File S8. An example website can be found in Supporting File S9. I usually weight the final product to be about 30% of the overall grade.

Invite Guests, Order/Create Prizes

Consider who might be good additional audience members for your student's final presentations. These might be more senior students in the same major, the senior students from the collaborating class, or other professors or staff. Invite them and let them know that they are encouraged to ask questions and that they will be asked to deliberate at the end to identify the team who they think best fulfilled the goals of the project. Winning this doesn't change the team's grade, but does award them a small prize. I have used giant microbes as prizes in the past, such as the [Superbug 6-pack](#), as the prizes for each member of the winning team. I can tell you that these become highly coveted items! If you do not have the budget for this, you could create a fun certificate or trophy instead. Both the invitations and prizes can be taken care of well in advance if preferred.

Print Color Copies of Brochure

I have ready access to color printing but my students do not, so I take care of printing color copies of the brochures before class day for the audience to pass around during presentations.

Project Class Day 6

In-Class Presentations

Determine presentation order and then time each group for their 10 minutes of time and 3–5 minutes of follow up questions. Depending on the number of groups presenting, you could adjust these timings. Act as facilitator for each presentation and transition. Although members of each group will receive the same grade for the presentation, as the instructor you should be mindful of differing skill levels of the presenters. Within the rubric guidelines, look for improvement and how well you believe they have done given their current capacity as a learner.

Prizes

Allow guest audience members to confer briefly and then announce the winning team. Distribute prizes. Cheer. Class complete.

Senior Class Component

Senior students critique the presentations as an instructor. This exercise reinforces their confidence and makes them feel accomplished and useful to the course. The students stay for the entire class.

Suggested Course Expansion

The COVID-19 pandemic has illustrated the importance of this project. However, the outbreak has highlighted a major gap within the original project design. Public health education campaigns may be well-designed and scientifically accurate, but if the sociocultural context of decision-making is not addressed, the campaign may fail. Overlooking important cultural values has been a barrier in failed campaigns. Additionally, overlooking the power of social group influence will ensure failure.

Individuals form values, evaluate self-concept, and make decisions in comparison to social groups (16, 17). Social groups with which we identify are many, but some examples are age, occupation, education-level, and religious affiliation (16). Once values have been formed and decisions have been made, individuals are loyal to and identify with like-minded people in the social group (17). To change a behavior or value is to risk losing status within the social group and possibly being ostracized by the group (17). For example, vaccinated members of social groups opposed to the COVID-19 vaccine, went to great lengths to hide vaccination status from the rest of the group (18). Informal leaders and respected group members may be more influential in decision-making than scientific and content experts (17).

Additional Student Activity

1. Provide education on the concept of sociocultural influence on health values and decisions.
2. Select 1–2 current examples of the power of social group influence on public health messaging
3. The freshman groups will discuss and answer the following questions in written format.
 - a. What social groups may your audience identify with?
 - b. What cultural beliefs and values could you consider in the creation of your materials?
 - c. Research social stigma associated with your disease. What did you find?
 - d. Research social groups who may be resistant to your message. What are the arguments against your message?
 - e. Brainstorm methods to incorporate social group values into your materials.
 - f. What informal leaders could you use to deliver your message? Brainstorm how you approach these leaders to assist in your goals. What obstacles do you anticipate?
4. The senior groups will evaluate the answers and provide feedback for improvement.

TEACHING DISCUSSION

For first-year nursing students, microbiology is a daunting course. However, this culminating project builds student confidence, enthusiasm, and provides a satisfying end to the semester. We have found structured project-based work, such as this, to be very well-received by first-year students, who appreciate the opportunity to work with their knowledge in an applied and practical way. Hearing from senior students in their own program furthers this sense of connection and importance. For senior-level students, the reaction is quite profound when they remember completing the project as first-year students. They immediately connect with the project and realize how much they have changed since their first year in college. Many of them are delighted to participate as an older, wiser student. It instills a sense of confidence and achievement. They also are able to apply newly learned health education and population health knowledge from their current public health nursing course. The group of students that are able to attend the presentations and assist in selecting the best presentation feel empowered by acting in an instructor role and feel a sense of belonging with the university in bridging the two classes.

We believe the project described here is quite robust and could be easily reimagined to serve microbiology students with other career trajectories. For example, a lower-level microbiology course for biology majors could be paired with an upper-level science communications, writing intensive, or capstone course to achieve a similar dynamic. Further, the pairing with senior students provides valuable vertical integration, but it is not absolutely necessary. The first-year project can be taught as a stand-alone lesson as well. We hope this lesson serves to inspire instructors to incorporate project-based learning into their classrooms and to consider novel cross-course collaborations that might enhance the student experience.

SUPPORTING MATERIALS

- S1. Public Health Project – Suggested Infectious Diseases
- S2. Public Health Project – Example Disease Worksheet
- S3. Public Health Project – A Few Essentials of Good Teamwork
- S4. Public Health Project – Project Summary Assignment and Rubric
- S5. Public Health Project – Project Draft Assignment and Rubric
- S6. Public Health Project – Peer Team Review Instructions
- S7. Public Health Project – Final Presentation Instructions and Rubric
- S8. Public Health Project – Example Brochure Influenza
- S9. Public Health Project – Example Website Pertussis (zoom in to read)
- S10. Public Health Project – Senior Assignment and Rubric
- S11. Public Health Project – Example of Senior Critique
- S12. Public Health Project – Summary of Lesson Components

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Table 1. Lesson timeline. Class-by-class description of activities with estimated time commitments for the microbiology course.

Activity	Description	Estimated Time	Notes
Preparation for Class 1			
Prepare disease worksheets, team assignments, project summary assignment	<ol style="list-style-type: none"> 1. Decide on the number of groups, ideally 3–5 students each. 2. Decide on a list of infectious diseases with public health implications. One disease per group in the class. (Supporting File S1). 3. Create a worksheet for each disease (Supporting File S2). 4. Print the worksheets and place each one into its own blank envelope. 5. Print or otherwise distribute “Essentials of Good Teamwork” sheet (Supporting File S3). 6. Print or otherwise distribute the project summary assignment (Supporting File S4). 7. Set up a common Google Sites website for your class. 	2–3 hours	Once you have developed a good set of worksheets, this task becomes just printing. Similarly, after becoming familiar with Google Sites, the website set up becomes quicker.
Class Session 1			
Introduce project	<ol style="list-style-type: none"> 1. Move everyone into their teams. 2. Hand out the “Essentials of Good Teamwork” sheet (Supporting File S3) and briefly review those elements. 3. Introduce the purpose and layout for the project. 4. Let teams come up to the front and choose their envelope. I make them open it in front of the class and announce what they have. 5. Give them 10–15 minutes to work through the worksheet questions. They can use their book and/or the internet. They don’t need to turn it in, this is just to get them started on thinking and researching. Warn them that one person from each team will report out at the end. 6. Have each team report out about their disease. Gently probe with questions or corrections if needed. 7. Make sure each team exchanges contact info. 8. Distribute and discuss project summary assignment. 	30–60 minutes	This is the time to get student buy-in so play up how interesting each microbe/disease is. The work for the day is low stakes (ungraded).
Preparation for Class 2			
Grade and generate feedback on project summaries, prepare draft assignments	<ol style="list-style-type: none"> 1. Grade and provide feedback on the project summaries. 2. Distribute draft webpage and brochure assignment with rubrics (Supporting File S5). 	1–2 hours	Correct any major misconceptions about the disease or organism, help guide thinking about a good audience for the project. The more targeted the easier it will be to make the brochure later. The project summary assignment is graded, but low stakes.
Class Session 2			
Return project summary feedback, distribute draft assignment	<ol style="list-style-type: none"> 1. Allow a few minutes for teams to read feedback and ask questions if needed. 2. Introduce and distribute draft assignment. 	10–15 minutes	

Activity	Description	Estimated Time	Notes
Class Session 3			
Draft brochure and webpage due	1. Students “turn in” their draft brochure and website digitally.	0–5 minutes	Students submit a digital copy of the brochure and you turn off editing on the website. The draft project assignment is graded and worth more than the summary, but not as much as the final draft.
Preparation for Class 4			
Prepare peer team review instructions	<ol style="list-style-type: none"> 1. Print or share digitally the peer team review instructions, direct students to have at least one laptop per team available for class (Supporting File S6). 2. Briefly look through projects and note any that are especially well done or especially lacking. 3. Assign review pairings. Depending on the size of your class and length of class periods, pair each team with 1–3 other teams for review (<i>i.e.</i>, each team reviews 1–3 other projects and will receive the same number of reviews back). 4. Print copies of brochures to distribute. 	30–60 minutes	I assign pairings based on topic (<i>e.g.</i> , a team with a virus can review another viral project) and based on performance such that any teams that are struggling will review at least one very strong draft. This allows the struggling team to see what is possible and for the strong team to have the challenge of a more complex critique.
Class Session 4			
Peer team review	<ol style="list-style-type: none"> 1. Have students sit in their teams. 2. Distribute instructions and briefly discuss. 3. Circulate while they work to answer questions and guide resolution of disagreements. 4. Instruct students to share their work by Google Doc (or other collaborative platform) with you before they leave. 	45–75 minutes	<p>Providing thoughtful, respectful, specific, feedback is hard work and in my experience students enjoy being in the position of expert and take this session very seriously.</p> <p>The peer team review is graded, but lower stakes than the draft itself.</p>
Preparation for Class 5			
Assemble feedback of project drafts, grade peer team reviews	<ol style="list-style-type: none"> 1. Review each brochure and website, grading against the rubrics and making notes of what was done well and what needs to be improved. 2. Review the students’ peer feedback from class, grade mostly according to effort. 3. Review the senior students’ feedback. 4. Combine your feedback with first-year and senior student feedback to make one coherent packet of feedback. 5. Print or provide digitally instructions for the final oral presentation (Supporting File S7). 	3–6 hours	This is the biggest investment of your time in the entire project so try to schedule it in such a way that you are not rushed and pace yourself.
Class Session 5			
Return project feedback	<ol style="list-style-type: none"> 1. Return feedback (physically or digitally) to teams. 2. Allow some in class time for them to read the feedback as a group, discuss, and ask questions. 3. Distribute instructions for final presentation. 	10–20 minutes	I emphasize that to get a good grade on the final product is attainable to all teams by addressing the feedback indicated. This provides a reasonable roadmap for success with the final product, even if the draft was rough.

Activity	Description	Estimated Time	Notes
Preparation for Class 6			
Final website and brochure due. Oral presentations	<ol style="list-style-type: none"> 1. Students should turn in the brochure file enough ahead of presentation time so that you can print color copies for the audience. 2. Invite guests to attend the final presentation. These guests won't determine a grade, but can ask questions, and determine an overall "best" project. 3. Obtain small prizes for the "best" project. 		<p>Since student access to printing might vary, I print the brochures for the groups to ensure that everyone has a high quality product to share.</p> <p>Good people to invite are more senior students in the major and relevant professors.</p>
Class Session 6			
Final presentations	<ol style="list-style-type: none"> 1. Breakdown time for presentations so that there is sufficient transition and question time. 		

Table 2. Senior course lesson timeline. Description and timetable of activities for the partnering senior course.

Activity	Description	Estimated Time	Notes
Preparation for Class 1			
Prepare assignment instruction sheet and individual assignments.	<ol style="list-style-type: none"> 1. Prepare the details of the assignment, including total points possible, assessment questions, and readability criteria. 2. Secure a list of targeted diseases from the first-year professor. 3. Assign each student a disease (in large classes multiple students will be assigned the same disease). 	2–3 hours	Once these tasks are completed the first time, preparation time will be reduced.
Class Session 1			
Introduce the assignment.	<ol style="list-style-type: none"> 1. Hand out assignment instruction sheet (Supporting File S10). 2. Review the purpose of the first-year student assignment. 3. Review the disease assignment for each student. 4. Explain that students will verify the readability level of the text using the Flesch-Kincaid Grade Level test. 5. Introduce the test, how to perform the test in Word, and how to interpret the results. 6. Review the assignment instructions. 	15–20 minutes	<p>Once this assignment is implemented for several years, the Senior students will remember completing the assignment as Freshman. They become excited about the project.</p> <p>Stress the importance that this is an individual assignment although more than one student will have each disease. No collaboration for the assessment.</p>
Preparation for Class 2			
Assign infectious disease project to be assessed.	<ol style="list-style-type: none"> 1. Upload the deidentified completed assignments (webpage and brochure) from the first-year students. Label each with the disease name only. 2. Announce to students that they can begin assessing the work according to the assignment instruction sheet. 	15–20 minutes	
Class Session 2			
Initial assessment of work.	<ol style="list-style-type: none"> 1. Review credible websites for disease information (CDC, WHO, etc.). 2. Remind students that any feedback must be based on credible websites. 3. Give students 15 minutes to begin reviewing website information on their assigned disease. Reinforce that information can change based on evolving research. 4. Review deadline for completion and instructions to turn in assignment. 	30–40 minutes	Students will complete their assessment outside of class. However, this kickstart activity reinforces quality sources.
Preparation for Class 3			
Grade assessments and prepare materials to be sent to the first-year professor.	<ol style="list-style-type: none"> 1. Grade assignments based on rubric criteria of credible sources utilized, depth of critique, and completeness of criteria. 2. Ensure each assessment is deidentified. Bundle according to disease and send to the first-year professor. 	3–4 hours	

Activity	Description	Estimated Time	Notes
Class Session 4			
Return assignment grades.	1. Return grades to students.	0–5 minutes	
Preparation for Class 5			
Assign students to attend the first-year infectious disease presentations.	1. Assign students to attend the first-year infectious disease presentations.	0–5 minutes	Depending on class size, this could be the whole class or a smaller clinical group.
Class Session 5			
Students attend presentations and offer feedback.	1. Ensure students understand the purpose of attending the presentations is to ask questions of the presenters and assist in determining the best presentation.	1–2 hours	

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