[Replace Text Here with Your Title]

[List authors by first name (optional middle initial or middle name) followed by last name. Separate multiple authors by commas. Use superscript numbers to link authors to specific affiliations, and symbols for author notes.]

First Middle Last1\*, First Last2†, and First M. Last1

**Affiliations:**

1Department Name, University/ Institution

2Precede each affiliation by a superscript number corresponding to the author list.

\*Correspondence to: Include the postal mail and email addresses of the corresponding author(s).

†Use symbols to indicate additional author notes (for example, equal author contributions, current addresses, etc.). Use in the following order (†, ‡, §).

**Type of Manuscript:** *CourseSource* LessonPlus Manuscript

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**Title and Description of Primary Image:** [Provide a title and a short description to accompany your primary image. All submissions must include an image that represents the information in the article (*e.g.,* a picture of a dividing cell for a lesson about mitosis; a picture of a swinging pendulum for a physics lab). This image will be displayed with the title of your article on the *CourseSource* website (it will not be in the PDF). Ensure that this image is not copyrighted. If students are photographed, students must consent to having their image published.]

Please provide a 4 x 3 image at high resolution (*e.g.,* 800 pixels wide x 600 pixels high).

# Abstract

[The abstract should be a single paragraph of 250 words or less. Start with an opening sentence that sets the teaching challenge that you address in this manuscript, provide background information specific to this course, briefly describe the course, and end with a concluding sentence.]

## Scientific Teaching Context

[In the LessonPlus article template, you will provide both a general description of the course and exemplar lesson(s) to help showcase the course. Please focus the Learning Goals to the course as a whole and the Learning Objectives to the specific lessons.]

### Learning Goal(s) for the Course

Students will:

[Provide clearly stated learning goals, which are broad statements of what the students will know once they have completed the course. In general, what is the course about?]

Learning goals are typically rather abstract and use words like “know,” “understand,” and “value.” (Appreciate should not be used as a synonym for “understand.” Avoid using “appreciate” unless you intend it to mean “value,” as in “Students will appreciate the role of science in society.”)

For example:

* Understand the steps of mitosis.
* Appreciate the importance of mitosis in the process of reproduction.

\*\*Additionally, list any society generated learning goals that align with your LessonPlus article. This helps readers find your article when searching by society generated learning goals. Briefly go through the Course Learning Frameworks, if available, for the course(s) that you identified as the area(s) for this manuscript. These learning frameworks can be found on the [*CourseSource* website](https://qubeshub.org/community/groups/coursesource/courses), under the “Courses” tab. You are welcome to use learning goals from multiple courses in your manuscript.

For example, the above Learning Goals, could align with the following society-generated learning goals:

* From Genetics Learning Framework:
  + “What are the molecular components and mechanisms necessary to preserve and duplicate an organism’s genome?”
  + “What are the mechanisms by which an organism’s genome is passed on to the next generation?”
* From Cell Biology Learning Framework:
  + “How do cells conduct, coordinate, and regulate nuclear and cell division?”

### Selected Learning Objective(s)

#### Justification

[Briefly describe the **one or two** lessons/ units you have picked to share and then describe why. For example: (i) a lesson at the beginning of the semester and one at the end to show student growth/progression of learning, (ii) a lesson from lecture and a lesson from recitation to provide insight into organization and alignment, and/or (iii) one exemplar lesson if organization is consistent during the course. Preferably, authors should select lesson(s) that can be adopted by readers as standalone lessons, if possible. Please limit this section to one page at 1.5 spacing, as there are other opportunities to elaborate on each lesson.]

#### Exemplar Learning Objective(s)

Students will be able to:

[Define what students can actually do after completing the exemplar lesson(s). Learning objectives describe student behaviors that are observable, measurable, and testable.]

Learning objectives should test students’ mastery of the material and use words like “define,” “predict,” “design,” and “evaluate.”

For example:

* Compare and contrast mitosis and meiosis.
* Predict consequences of abnormal meiosis.

## Introduction

[The introduction should provide the origin and rationale for the design of the course and provide enough background information to allow the reader to evaluate both the pedagogical approaches and the scientific content of the course. **Citations should be present throughout this section.**]

Place your work in the context of the published work of others. Provide citations to similar courses, lessons, or approaches, if they exist. How does your course build on the activities, assessments, etc. of others?

The Introduction should be written at the level of the whole course, not the individual lessons.

### Intended Audience

[Describe the student population(s) who were engaged in the course, including their level and major affiliation. For example: first-year students at a large research university; science majors at a community college; non-science majors in a summer research program; advanced biology students at a liberal arts college, etc.]

### Term and Context Description

[Provide a description of the time needed to complete the course, using weeks and hours (*e.g.,* 10 weeks with two 3-hour lab periods a week). Keep in mind that other readers and universities may use different scheduling methods (*e.g.,* trimesters, semesters, and quarters), so be specific. Additionally, describe the conditions in which it was taught. For example, did the class involve fieldwork, lab, lecture, recitation, etc.?]

### Prerequisite Student Knowledge

[Provide a description of the knowledge and skills that students should have before completing this course. Prerequisite knowledge may include both skills and background content knowledge. Specify whether your department has any prerequisites for this course.]

### Prerequisite Teacher Knowledge

[Provide a description of the prerequisite knowledge that an instructor needs to teach this course. Prerequisite knowledge may include both skills and background content knowledge.]

## Scientific Teaching Themes

### Course Structure

[Describe your course approach (*e.g.,* inquiry, CURE) and how the structure of your course promotes student engagement. While you can provide examples from your exemplar lessons, this section should be at the level of the whole course. Reference literature that aligns with techniques and frameworks used in the course.]

### Assessment

[Describe how the instructors measured learning over the course. Again, while you can provide examples from your exemplar lessons, this section should be at the level of the whole course. How did students self-evaluate their learning? Did instructors use alternative grading styles such as ungrading? What did students submit (*e.g.,* posters, essays, portfolios)? List and/or explain the kinds of assessment tools used to measure how well students achieved the learning objectives. Reference literature that aligns with the assessment strategies used in the course.]

### Inclusive Teaching

[Describe how your course includes all participants and acknowledges the value of diversity in science. List and/or explain how the course is inclusive and how it leverages diversity in the classroom and beyond. Reference literature that aligns with inclusive teaching practices used in the course.]

## Course Schedule

[Briefly describe the course sections or units (topics, modules, projects) and your rationale for the organization and inclusion of the units. These descriptions should be, **at most, half a page** for each module. Link the course units to the Learning Goals provided in the Scientific Teaching Context section.]

**All submissions must include a Course Schedule Table that shows the schedule and concepts for the course, using the Course Schedule Table Template available** [**here**](https://qubeshub.org/community/groups/coursesource/for_authors)**. The contents in the Course Schedule Table should be brief.**

## Exemplar Lesson Plan #1

[Describe the first lesson plan. See below.]

## Exemplar Lesson Plan #2

[Describe the second lesson plan. See below.]

[Provide a description of your lesson(s) that is complete and sufficiently detailed that a teacher with less skill or scientific expertise in the course’s discipline would be able to teach it. This section should capture how you would explain to a colleague how to teach your class for you. Please keep these sections as brief as possible. Authors may submit Supporting Files relevant to the lesson (*e.g.,* assessment worksheets, rubrics), but descriptions of their use must be concise. Please use the notes section of the Teaching Timeline Table to discuss Supporting Files.]

**All submissions must include a Teaching Timeline Table containing a recommended timeline for EACH exemplar lesson, using the Table Template available** [**here**](https://qubeshub.org/community/groups/coursesource/for_authors)**. Each Teaching Timeline Table should be detailed (more detailed than the Course Schedule Table).**

For example, if you describe **two lessons**, you will submit **three tables**: (1) Course Schedule Table, (2) Teaching Timeline Table for Lesson 1, and (3) Teaching Timeline Table for Lesson 2.

Subheadings can be included within any of the sections to increase readability and clarity. Use the embedded styles in Microsoft Word, accessible from the HOME tab:

### Heading 3

#### Heading 4

##### Heading 5

Please use the BlockQuote style when you want to:

Designate a student quote, label instructor script during an activity, or differentiae spoken word from the main text.

Please use the StandOut style when you want to:

Make specific text distinct or separated from the main text such as a clicker question. This is similar to BlockQuote in appearance, but should not be used to indicate speech.

*\*For website links:*

* If you want to direct readers to watch a YouTube video, read an article on a website, provide a website for purchasing equipment, etc.:
  + Provide the URL link in parentheses following the underlined text you want hyperlinked.
  + An example: Students watch a short video about photosynthesis (<https://www.youtube.com/watch?v=2KZb2_vcNTg>) prior to the activity.
  + Do not include in the citation list.
* If you want to use an article from a website as a citation (*e.g.,* NPR), please use it as you would a normal citation. See the References section below to see how to format a Website citation.

The actual URL in parentheses will be removed prior to publication, but is necessary for you to include to ensure we publish using the correct links.

## Teaching Discussion

[Describe your observations at the level of the course, not the individual lessons. This may include student reactions to the course, which units worked well or need changed/ reordered/ removed, logistical considerations/ challenges (equipment, transportation), suggestions for possible improvements or adaptations to different courses or student populations, and discussion of student outcomes. How did you assess the efficacy of the course? Were the course-level learning goals achieved? You may choose to include examples from the lessons (*e.g.,* how learning objectives were achieved), but the overall focus on this section should be discussing the course.]

**Institutional Review Board (IRB)/ Behavioural Research Ethics Board (BREB) Approval**

* **You may be required to provide an ethics board protocol number**. US Federal regulations require IRB review and approval for projects that:
  + (1) Meet the definition of research
  + AND (2) Involve human subjects
* Research is defined as “a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.” (*e.g.,* testing a hypothesis; randomization of subjects; comparison of case vs. control)
* A human subject is defined as “a living individual about whom an investigator (whether professional or student) conducting research:
  + Obtains information or biospecimens through intervention or interaction with the individual, and uses, studies, or analyzes the information or biospecimens; or
  + Obtains, uses, studies, analyzes, or generates identifiable private information or identifiable biospecimens."
* Most articles submitted to *CourseSource* will be considered as Quality Improvement and/or Program Evaluation, and IRB review is not required because the project does not constitute research as defined under 45 CFR46.102(d).
* However, ***if your project is considered research and/or you present and discuss human subjects’ data,*** [***IRB review is required***](https://www.american.edu/irb/irb-no-review.cfm). This includes, but not limited to:
  + Student performance data (*e.g.,* pre/post scores on an assessment)
  + Student quotes, particularly if the quotes were gathered from a survey that collected identifying information (*e.g.,* their name) or from interviews
* If you use student data, you must either provide an IRB protocol number OR certification by the IRB or the institution that IRB review was not required. Please provide this information in the Acknowledgements or adjacent to the data (often in the Teaching Discussion section).
  + **IMPORTANT**: While your project may not be considered ‘research on human subjects’, [intent to publish results may change its designation to research and thus require IRB approval](https://stockton.edu/research-sponsored-programs/documents/irb/FAQs.pdf). Ensure that when submitting for approval to your IRB that you *state your intent to publish results from the project* (*e.g.,* survey data, test scores, quotes).
  + If considered research on human subjects, it will likely undergo review under the “exempt” category. This means that your study requires only an initial review and is *exempt from ongoing review*. [Exempt does not mean *exempt from any IRB review* nor exempt from general requirements for informed consent and protection of subjects](https://www.iup.edu/research/resources/conducting-responsible-research/irb/guidelines/exemptions.html).
* What if my institution does not have an IRB board?
  + We recommend that you do not provide any human subjects’ data. Instead, discuss your observations, overall student reactions, or general classroom performance.
  + If you still wish to provide such data, you must provide a statement(s) in your article regarding:
    - IRB review was not available
    - Description of ethical procedures and practices that were followed (*e.g.,* maintaining the anonymity of student participants, data management and protection, and student consent)
    - The research posed minimal risk to students and was conducted in established or commonly accepted educational settings
* **Common exceptions:**
  + An IRB is not needed if you are presenting data collected from an anonymous survey. If the survey collected identifying information (such as names or demographics), even if de-identified later, we cannot publish the data without an IRB.

## Supporting Materials

### Peer-Reviewed Supporting Files (max 20 files)

* S2. Soil Sleuths – Lab 1
* S3. Soil Sleuths – Lab 2
* S7. Soil Sleuths – Student Reflections Assignment

### Other Supporting Files

* S0. Soil Sleuths – Complete Course Contents
* S1. Soil Sleuths – Course Syllabus
* S4. Soil Sleuths – Lab 3
* S5. Soil Sleuths – Lab 4
* S6. Soil Sleuths – Lab 5
* S8. Soil Sleuths – Quiz [Instructor view only]

[Replace the above text with a bulleted list of all your supporting files. A short description is not required, but can be added if desired. If you would like to restrict access of any supporting files to only instructors (*e.g.,* exam questions, exam key), please indicate in the bulleted list.]

**Important Changes for LessonPlus Articles**

Due to the high volume of supporting files submitted, we are unable to peer-review all Supporting Materials (SM). To still facilitate high-quality review of manuscripts, we are asking LessonPlus authors to separate their SMs into two categories: peer-reviewed and not peer-reviewed. The SMs in your peer-reviewed category should be **directly related to the course overview/ exemplar lessons**. The SMs in the not peer-reviewed category are **all the other documents needed to implement the course**.

**At most, you may only submit 20 peer-reviewed supporting files.**

Additionally, we request that authors create a “table of contents” to direct readers on how/ when to use all the Supporting Files. We recommend adding a column to the Course Schedule Table that describes which SMs (peer-reviewed AND not peer-reviewed) are used in each week or module. If needed, briefly describe each file after the table. Please make this "table of contents" document the first SM in the not peer-reviewed category. Please name this file "S0. Short article title – Complete Course Contents"

**How to Name Your Supporting Files**

Begin with the letter “S” and the number representing the order *in which the material is used logically in a course’s progression*. For example, a course syllabus could be S1, week 1 materials could be S2–S5, week 2 materials could be S6–S9, etc. Follow the S#. with a short version of your article title. For example, shorten “Soil Sleuths: A Semester-Long Bacterial Identification Lab Course,” to “Soil Sleuths”. Then include a brief title of the resource, such as lecture slides, worksheet, etc. **Please use this name in the Supporting Files list in your manuscript**.

For example: “S1. Soil Sleuths – Course Syllabus”

**How to Name the Actual Files**

First, name each file the same name used for the Supporting Materials List. Then, add the following name extension to your SMs based on what category they belong in: \_PR or \_notPR

For example:

“S2. Soil Sleuths – Lab 1\_PR”  
“S0. Soil Sleuths – Complete Course Contents\_notPR”

**How to Reference Supporting Materials**

When referencing supporting files within the text, do not refer to these files as “supplemental.” You may refer to the supporting files using parentheses or within the text. If using parentheses, please list the numbers the same as you would an ASM citation. For example: (Supporting Files S7, S8) and (Supporting Files S10–S15). If referencing file(s) within the text, please use proper grammar.

**Examples of in-text supporting file reference in parentheses:**

* ONE: Print one set of cards for the sorting game (Supporting File S1).
* MULTIPLE: Additional learning materials (Supporting Files S1, S4–S15) were created to facilitate the online transition as a result of the COVID-19 pandemic.

**Examples of in-text supporting file reference outside parentheses:**

* ONE: If this dataset will be used for the activity, instructors may refer to information presented in Supporting File S14.
* MULTIPLE: Example grading rubrics are in Supporting Files S12 and S13.

**All peer-reviewed Supporting Materials MUST be referenced at least once** in the main text and/or within the Teaching Timeline Table(s).

**Additional Important Information:**

* When possible, please use **editable file formats** such as Word, PowerPoint, Excel, etc. Avoid PDFs if possible—PDFs are difficult to be made accessible as well as hard for reviewers, editors, and readers to edit.
* Wherever possible, ensure that the article title and name(s) of author(s) are visible when a reader opens the file. Suggested areas include in a header, on the first page/first slide, or as a “Notes” sheet in a spreadsheet workbook.
* Upload a separate file for each supporting material item when you submit your article. **Do not embed any of this information in the manuscript text file**.
* The maximum size for each supporting file is 100 MB.
* In supporting files that contain lecture slides, it is helpful to include notes about materials and transitions to help the reader teach the materials.

### Images and Copyrighted Materials

Do NOT include copyrighted materials in your manuscript or in your Supporting Materials.

All images have to either be **open source**, the **author’s own creation**, or **have received permission** from the original creator. Figures from papers or textbooks are not allowed (unless authorized in writing).

To ensure there are no copyrighted materials, authors must provide an adequate description of where images or photos are sourced from. For example:

* Image credit: author name, picture taken in-house
* Image of Earth on left side is open source from <https://www.website.com>
* Figure reprinted with permission from journal (article citation)

Authors should provide this information in the image caption. If in PowerPoint, please put the information in the Slide Notes for each slide that contains an image.

If the image is copyrighted, **it must be deleted**. Authors can choose to replace the image with an open source version (with reference as described above). Or they can put a placeholder box with a description of what image to insert. For example:

* Insert Figure 8 from Flowers *et al.,* 2023 here (provide link, DOI, or citation)
* Place image of particle accelerator from this website (embed link) here

This way, there is no uncertainty about the image’s open source/ copyright status and it still allows readers to use images recommended by the authors.

### How to Find Open Source Images

Below are suggested methods for finding open source images. Please only submit images that are in the **public domain** or are **compatible with our licensing**, [**CC BY-NC-SA 4.0**](https://creativecommons.org/licenses/by-nc-sa/4.0/deed.en) (Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License), such as: [**BY**](https://creativecommons.org/licenses/by/4.0/), [**BY-NC**](https://creativecommons.org/licenses/by-nc/4.0/deed.en), and [**BY-NC-SA**](https://creativecommons.org/licenses/by-nc-sa/4.0/deed.en).



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#### [Creative Commons Search](https://search.creativecommons.org/)

This site links out to a variety of search engines for various media. Try them out yourself! Simply go to Creative Commons Search, select your search engine, and submit your inquiry. Here’s how you can refine your search or check that your searched images are compatible:

#### [Openverse](https://openverse.org/)

Ensure “Filters” is open on the right side, and select compatible licenses.

#### [Flickr](https://www.flickr.com/)

Click on an image of interest. On the loaded page, scroll underneath the photo and click on “Some rights reserved” on the right side to view the license.

#### [Google Images](https://www.google.com/imghp?hl=en)

Refine your search by selecting “Tools” > “Usage Rights” > “Creative Commons licenses.” When you click on an image, you will find “License details” hyperlinked below. Click on the link to make sure the image is compatible.

#### [Wikimedia Commons](https://commons.wikimedia.org/wiki/Main_Page)

Click on an image file of interest. On the loaded page, scroll down to “Permission” or “Licensing.”

However, it is easier to do the following: On the right hand side of the search results page, click “Switch to MediaSearch.” Once the page is loaded, select “License” > “No restrictions.”

## Acknowledgments

[Replace these instructions with your acknowledgements, which can include funding information.]

## Table and Figure Captions

[**Upload a separate file for each table and figure** when you submit your article. Do not embed the table or figure in this text file. **All Tables and Figures MUST be referenced at least once** in the main text.]

## Tables

**Table 1.** Name of table. Table captions should contain a short description of the table.

## Figures

**Figure 1.** Name of figure. The figure caption should begin with a sentence that describes the overall “take home message” of the figure. **(A)** Indicate figure parts with capital letters. **(B)** You should reference/ describe each figure part in the main text as well.

**IMPORTANT:**

* All tables must be submitted using the provided [table template](https://qubeshub.org/community/groups/coursesource/for_authors) and as a DOCX file (not PDF).
* All figures must be submitted in a graphic file format such as JPEG (PDFs will not be accepted).
* Ensure that no copyrighted materials (or copyrighted materials without permission) are included in your article or in your tables and figures.

## References

[Replace these instructions with your reference list.]

The citation style of *CourseSource* follows the [standards set by the American Society for Microbiology (ASM)](https://journals.asm.org/journal/jmbe/reference-style). Here are general guidelines:

* Cite references in the text by placing the reference number in parentheses (or brackets when relevant). Number the references in the order in which they appear. For example:
  + Several CUREs have been developed recently in the field of ecology (1–5). CURES have the potential to increase student success (6, 7). There are multiple consortiums available to help scholars develop their own CURES (see Consortium A [8], Consortium B [9], and Consortium C [10] for more information). Despite this growth, research suggests that interdisciplinary CUREs are lacking in the current literature (4).
* If you are using reference organization software, **you must submit an unlinked version**.
* Abbreviate the names of journals, according to the list in [NCBI](http://www.ncbi.nlm.nih.gov/nlmcatalog/journals). **Remove any periods**.
* List all authors of the reference.
* Use sentence case for titles (helpful website: <https://titlecaseconverter.com/> )
* **DOI numbers must be included**, if a citation has one. Format for DOI numbers can be:
  + doi:10.1187/05-06-0082
  + OR
  + <https://doi.org/10.1187/05-06-0082>
* If multiple references are cited in the same citation, number them by date order with the oldest citation as the lowest number.
* References in the list should **only be of references in the main text**. Any references in the Supporting Materials should be listed separately within the Supporting Material.

Examples of reference style:

**Journal Articles**

1. Knight JK, Wood WB. 2005. Teaching more by lecturing less. Cell Biol Educ 4:298–310. doi:10.1187/05-06-0082.

**Book/ Report**

1. Handelsman J, Miller S, Pfund C. 2006. Scientific teaching. W.H. Freeman, New York, NY.

**Book Chapters**

1. Dennen VP, Burner KJ. 2008. The cognitive apprenticeship model in educational practice, p 425–439. *In* Spector JM, Merrill MD, van Merriënboer J, Driscoll MP (ed), Handbook of research on educational communications and technology, 3rd ed. Lawrence Erlbaum Associates, New York, NY.

**Websites**

Author (if unavailable, use website host). Year published (if unavailable, use update/ revision date; if unavailable, write “n.d.”). Article title. Website host (if not already used as author). Retrieved from URL (accessed day month year).

*Examples:*

1. California Department of Fish and Wildlife. 2022. Gray wolf. Retrieved from <https://wildlife.ca.gov/Conservation/Mammals/Gray-Wolf> (accessed 19 October 2022).
2. Ray J, Marken S. 2014. Life in college matters for life after college. Gallup. Retrieved from <https://news.gallup.com/poll/168848/life-college-matters-life-college.aspx> (accessed 14 July 2022).

*Please note an important distinction!* If you use a website page as a citation, please cite it properly—such as (4)—and include the citation in your references list. If you are providing information for readers (such as a YouTube video for students to watch, a website to buy lab supplies from, a popular science article for students to read, etc.), do not cite the website in-text and do not include it in the references list. Formatting would look as follows (as described previously):

Students watch a short video about photosynthesis (<https://www.youtube.com/watch?v=2KZb2_vcNTg>) prior to the activity.

Visit the [ASM website](https://journals.asm.org/journal/jmbe/reference-style) for the most current information regarding formatting of references. [This website](https://www.unr.edu/writing-speaking-center/student-resources/writing-speaking-resources/american-society-of-microbiology-(asm)-style) is also a helpful resource for how to cite different kinds of references, but may not have the most up-to-date information.

**Citation Managers**

Two citation styles are available to download from the [*CourseSource* For Authors page](https://qubeshub.org/community/groups/coursesource/for_authors). For information on how to install and the difference between the two versions, please visit our website.