

Preparing a Curriculum Section Manuscript

GENERAL GUIDELINES

Curriculum articles describe innovative, field-tested activities that may be used in the classroom, laboratory, and/or field or online. The activities are ready for adoption by instructors teaching biology so detailed instructions for students and directions for instructor preparation and use are important components of all curriculum articles. To facilitate ready use of the activity all institution specific references (e.g., course numbers, facilities) should be absent. Curriculum articles also:

- List learning objectives
- Use high-impact pedagogical practices that engage students in thinking beyond knowledge and comprehension (e.g., about application, analysis, synthesis, and evaluation)
- Describe previous use of the activity in the classroom or laboratory
- Include examples of student data and/or outcomes expected from the activity
- Provide suggestions for determining student learning
- Provide adequate support materials (e.g., references to background information, student worksheets, answer keys, sources of materials, etc.)
- Present results of assessment of student achievement, demonstrating that the stated learning objectives have been met
- Suggest possible modifications and/or extensions

Manuscript length: 1,000 to 4,000 words in length, including the abstract and excluding the references. Word limit does not include supplemental materials (e.g., student instruction handouts, directions for preparation, and student learning assessment materials).

Manuscript Review Criteria. Reviewers are provided a rubric to guide their assessment of a manuscript (see below). Authors are highly encouraged to review the rubric and to read several *JMBE* Curriculum articles prior to submission.

Editorial Style. For examples of ASM journals style conventions, review manuscripts in your intended section before submitting your manuscript. ASM copyeditors and the *JMBE* production staff reserve the privilege of editing manuscripts to conform to ASM stylistic conventions and these Author Guidelines. Authors who are unsure of proper English usage should have their manuscripts checked by someone proficient in the English language. Manuscripts may be editorially rejected, without review, on the basis of poor English or lack of conformity to the standards set forth in these Author Guidelines.

Copyediting. After final acceptance, a manuscript will be copyedited to conform to the editorial style of the ASM Style Manual for Journals (American Society for Microbiology, 2011, in-house document) and How to Write and Publish a Scientific Paper, 6th ed. (Greenwood Press, Westport, CT, 2006), as interpreted and modified by the editors and the *JMBE* production staff. It is the responsibility of the corresponding author to read the copyedited manuscript he or she will receive, and to answer all queries fully.

MANUSCRIPT COMPOSITION AND FORMATTING

File Format. The submission file should be in Microsoft Word.

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Document Format. The text should be double-spaced; using a 10-point Times New Roman font or equivalent; employ italics, rather than underlining (except for URL addresses); include line numbers; and have figures and tables placed at the end of the text, rather than embedded within.

Website Linking. All URL addresses in the text should be activated and ready to click.

Figures and Tables. Figures and tables are numbered and include a heading followed by a period. **Permissions are required to reproduce or modify figures and tables within the submitted manuscript and any associated supplemental materials.**

Images. All images are uploaded as Supplemental Files in JPG or GIF format with 300 dpi (color or grayscale). Monochrome images have been saved in grayscale mode; color images are in RGB. No BMP, RTF, or TIF images are permitted. Images should be at least 3 inches and no greater than 5 inches in the greatest dimension. **Permissions are required to reproduce or modify images within the submitted manuscript and any associated supplemental materials.**

Cover Pages. The following information should be included as part of the manuscript submission:

Title Page. Includes: information in the title that [increases discoverability](#) (see below); authors' names, highest academic/professional degree(s), and institutional affiliation(s); contact information for the corresponding author; source(s) of support for the work presented in the article; running head or foot line of approximately 40 characters; and number of figures, tables, and supplemental materials.

Conflict of Interest Notification Page. As outlined in the "General Guidelines" section, a Conflict of Interest Notification Page must immediately follow the manuscript's title page. To prevent ambiguity, authors must state explicitly whether potential conflicts do or do not exist.

Abstract and Keyword Page. Limit the abstract to 250 words or less and concisely summarize the basic content of the paper without presenting extensive details. Avoid abbreviations and references and do not include diagrams. When it is essential to include a reference, use the same format as for the References section but omit the article title. The abstract must be complete and understandable without reference to the text. In addition to the abstract, include 3 to 10 key words or short phrases that describe the manuscript contents.

MANUSCRIPT TITLE GUIDELINES

Creating a title that conveys the purpose of your work can be one of the most difficult parts of scientific writing. Before digital archiving, "eye-catching" titles were preferred because they could draw a reader to the abstract. In today's research environment, keywords in titles and abstracts are the most important indicator that a paper will be read. Remember: if it can't be found (and quickly!), it won't be utilized. Below are some guidelines and an activity to help you craft a title.

The *JMBE* Editorial Board recommends that you consider these questions as you develop a title for your submission:

- **What organism/research method/activity style/key concept is central to your paper?** Make sure this appears in your title.

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- **What action is your manuscript calling for?** What do you want the reader to do after reading your manuscript (i.e. revise policy, use it in their classroom, etc.)? Make sure that similar action verbs are reflected in your title or abstract.

- **What keywords would you use to search for your article?** Make a list of the top five keywords and then use them in a search. Are the papers that you find in a similar vein to yours? If yes, make sure to incorporate these keywords appropriately in your title.

- **Is your title ambiguous or misleading?** Ask someone who is not familiar with your paper to read just the title of your manuscript and have them tell you what they think it is about. If they misinterpret your title, have them clarify which words were confusing. Remember: someone searching for your paper may not have your expertise.

- **Don't get too carried away.** While you want your title to describe your paper accurately, it might not be attractive to today's reader if it is more than one line long. Remember that there is an abundance of resources available to today's reader, and if they don't find your title and understand the content quickly, they will not read it!

Now take the test!

Consider the following fictitious titles, which are based upon published submissions. Which one do you think would attract the most search hits? What makes the other titles ineffective?

Giving the Undergraduate Laboratory Meaning and Purpose
Exploding Cells and Dynamic Colors: Creating Engaging Laboratories in the Science Classroom
Laboratory Exercises that Promote Student Engagement and Learning about Osmosis

Answer:

While not particularly "original," the third title is the best in terms of keywords that will guide a reader to the manuscript. It states the topic of the laboratory, and indicates what the reader can gain from reading the manuscript (ways to engage and promote student learning).

Giving the Undergraduate Laboratory Meaning and Purpose
> Is this a discussion of HOW to give a lab meaning and purpose or WHY it is important? Both? What is covered in this laboratory? This is the vaguest title, and is likely to be passed over because it is not specific or clear enough to draw in a reader.

Exploding Cells and Dynamic Colors: Creating Engaging Laboratories in the Science Classroom
> While "eye-catching," it isn't clear whether this is a "how to" article or an overview of the author's experience. It also remains vague on what students actually learn in the laboratories.

MANUSCRIPT HEADINGS AND SUBHEADINGS

INTRODUCTION — The introduction should provide sufficient background information to allow the reader to evaluate the applicability of the curriculum activity to their needs. It should provide the rationale for design of the curriculum activity and enough information to allow the reader to evaluate the activity without referring to previous publications. It should also indicate whether the exercise is a classroom, laboratory, field, and/or online activity. In addition to this background information, introductions are expected to contain the following subsections: intended audience, learning time, prerequisite student knowledge, and learning objectives.

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Intended audience. Indicate the intended audience for the activity. For example: microbiology/biology majors, allied health majors, biotechnology majors, science education majors, or non-majors.

Learning time. Indicate the approximate class or lab time required and/or any follow-up in one or more subsequent periods. Also describe any time required outside of the regularly scheduled class or lab periods.

Prerequisite student knowledge. Indicate prerequisite knowledge and skills that students should have before completing this activity.

Learning objectives. Provide a list of clearly stated learning objectives. Learning objectives must describe student behaviors that are observable, measurable, and testable. They may start with the phrase "Upon completion of this activity, students will...." Accepted submissions will include assessment results that directly test these stated learning objectives.

PROCEDURE — The procedure section includes all information needed to allow instructors to repeat the activity with their classes. It includes the following subsections: materials, student instructions, faculty instructions, suggestions for determining student learning, sample data, and safety issues.

Materials. Provide a clear and complete list of materials, indicating whether they are readily available or need special ordering. Materials should be organized in terms of "items per student," "items per group," and "items per lab." Multi-unit activities should indicate the materials needed for each unit. Include recipes or references for all media and solutions. Materials may be provided as a supplemental file (please indicate this availability in the text of the main document).

Student instructions. Provide a clear and complete set of instructions for students to perform this activity. Most activities include handout-ready student instructions as a supplemental file (please indicate this availability in the text of the main document). Instructions should not contain information that would be relevant only to your class (e.g., class number, date, etc.).

Faculty instructions. Summarize the steps of the procedure for the faculty member's benefit and include any explanations that are needed to help the faculty make the activity work smoothly. Include all preparation steps and any special clean-up or follow through required. Include any hints, tricks, or pitfalls to avoid. Also appreciated are suggestions for acquiring hard-to-get materials or special items. Please try to include those things that you do automatically, which someone else may not know but will contribute to the success of the activity. These instructions will not be handed out to students. Please keep in mind that not all instructors have the same background as you - many *JMBE* readers are looking for activities outside their own area of expertise and rely on detailed faculty instructions to ensure the success of the activity. Faculty instructions may be provided as a supplemental file (please indicate this availability in the main text of the document).

Suggestions for determining student learning. Share the assessment methods that you have used to determine if students have achieved your stated learning objectives and the methods you use to assign grades. Examples include assignments and exam questions. Rubrics or grading keys should also be provided (please indicate this availability in the main text of the document if these items are included as supplemental files).

Sample data. Provide examples of student work and/or expected student outcomes to help provide faculty with a fuller sense of the range of outcomes for the activity. Possibilities include text submitted by students, data gathered, photographs or short movie clips, etc. Remove any

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identifying information. Sample data may be provided as a supplemental file (please indicate this availability in the main text of the document).

Safety issues. Address all safety issues faculty and students need to know when attempting this activity, using the [ASM Guidelines for Biosafety in Teaching Laboratories](#) as a reference. Safety concerns may include (but are not limited to): biosafety level of strains used; chemical considerations; UV; environmental unknowns; etc. If there are no safety issues, state why this is so.

DISCUSSION — The discussion section should highlight the activity's effectiveness in achieving the stated learning objectives, and provide evidence of student learning. The discussion may elaborate on how the activity may be adapted to different course situations or different student audiences. The discussion should include the following subsections: field testing, evidence of student learning, and potential modifications.

Field testing. Please indicate course conditions in which you have used this activity (number of semesters, size of class, audience, etc.). If appropriate, include the results from any informal assessments or surveys of this activity as an indication of student and faculty responses to the activity.

Evidence of student learning. Tell us how you know that this exercise is effective. Provide results from assessments that demonstrate student learning across stated learning objectives. Appropriate examples of evidence include pre-/post-testing, normalized learning gains, and/or post activity assignments /questions with statistics of student performance toward different objectives. Perceived learning as measured by student attitude surveys, while effective in demonstrating student interest, are not appropriate as evidence of student learning.

Possible modifications (optional). Outline ways your activity can be modified or extended to broaden its appeal for faculty in other settings or facing alternate curriculum goals. For longer activities, elaborate on alternate timelines to adapt the activity to different course schedules.

ACKNOWLEDGMENTS — The source of any financial support received for the work being published must be indicated in the Acknowledgments section. It will be assumed that the absence of such an acknowledgment is a statement by the authors that no support was received.

REFERENCES —References should be listed in the order in which they appear in the manuscript (citation-sequence reference system). Arabic numerals in parentheses serve to identify references in text, tables, and legends. Please review the [ASM Style Guide for References](#), and refer to journal articles published in 2012 and beyond. *JMBE* strongly encourages authors to use professional literature citations from recognized genres of scholarly publications such as peer-reviewed journal articles and authored or edited books. The appeal to electronic encyclopedias and/or online knowledge-sharing tools should be made only in those circumstances where more generally recognized scholarly sources are unavailable and/or incompatible with the author's intent. When such is the case, these citations must be embedded parenthetically in the manuscript's narrative as opposed to being included as entries in the References section.

SUPPLEMENTAL MATERIALS (If applicable) — Include any necessary information that does not fit easily into the categories above as appendices. Supplemental materials should be uploaded as one Word doc file. Designate all materials as Appendix 1, Appendix 2, etc., within the manuscript text and list the appendices at the end of the manuscript as well. **Permissions are required to reproduce or modify images, figures (including maps), and tables within the supplemental materials.** A formatted and

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linked Table of Contents will be provided for supplemental materials once the manuscript and associated supplemental materials have been accepted for publication in *JMBE*.

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Curriculum Section Review Criteria

Criteria	Acceptable as submitted; no change or simple corrections (1)	Needs modifications or improvements (2)	Fundamental revisions or additions required (3)
Worthwhileness			
Impact	The activity is innovative and includes at least one high impact practice, e.g. peer collaboration, oral and/or written communication, problem solving, active learning, etc.	Activity includes some new methods and approaches and marginal active engagement of students.	Activity does not include any novel methods or approaches and students are not actively engaged.
Depth	The activity actively engages students in thinking beyond knowledge and comprehension such as application, critical thinking, synthesis, analysis, or evaluation.	The activity requires students to understand core concepts; it encourages students to apply skills to new situations.	The activity fosters basic understanding but does not involve applications of knowledge to new situations.
Outcomes	The learning objectives describe measurable behaviors and outcomes. The activity as conceived and presented is designed to support the learning outcomes.	The learning objectives as stated are difficult to measure. The activity as conceived and presented could include additional outcomes and/or does not support the stated learning outcomes.	Learning outcomes are absent or not measurable and not represented by the activity as it is conceived and presented.
Coherence			
Time Management & Student Prerequisites	Intended audience provided and not institution specific. Activity preparation times and student meeting times provided (number of minutes/hours or class periods). Prerequisites student knowledge provided.	Intended audience unclear or incomplete and/or institution specific. Activity preparation times and student meeting times are suggested but require clarification. Prerequisite student knowledge incomplete or requires clarification.	Intended audience not provided. Preparation times and student meeting times vague and/or unrealistic or not provided. Prerequisite student knowledge unrealistic or not provided.
Preparatory Support	Materials list is clear, complete, and well organized as amount required per student, per group, or per lab. Sources for materials	Materials list is essentially complete, but lacks important details. Sources for some key items not suggested. Recipes and storage	Materials list is incomplete and/or items are expensive, difficult to obtain, or pose safety hazards. Sources for items not

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	are suggested and recipes and storage instructions are provided as necessary.	instructions vague or incomplete.	suggested and recipes and storage instructions absent.
Safety Guidelines	Safety issues (microorganisms, toxicity, flammables, corrosives, combustibles, etc.) are identified and described.	Safety issues absent for some materials (microorganisms, toxicity, flammables, corrosives, combustibles, etc.).	Safety information absent or incorrect.
Competence	Acceptable as submitted (1)	Needs modifications (2)	Fundamental revisions required (3)
Student Procedures	Instructions are provided in the form of a student handout. Procedures are clear, complete, well organized, and presented at the appropriate level. Institution specific references absent.	Instructions and procedures are essentially complete, but may be unclear or need minor modifications. Instructions are not in the form of a student handout. Contains institution specific references.	Instructions and procedures are incomplete or unclear. Procedures are provided at an inappropriate level. Student handout is clearly needed but not included.
Instructor Procedures	Instructions are organized, succinct, and include explanations or clarifications that allow the activity work smoothly. Institution specific references absent.	Instructions and procedures are essentially complete, but may be unclear or need minor modifications. Contains institution specific references.	Instructions and procedures are incomplete or unclear. Specific methods or steps require additional clarifications.
Student Evaluation	Suggestions for determining student learning are well described and methods are appropriate and effectively measure the stated learning outcomes. Sample grading rubrics provided if appropriate.	Assessment methods are suggested but require clarification and/or do not measure whether students have met the learning outcomes. Sample grading rubrics provided but require clarification or rubrics are absent.	Suggested assessment methods are inappropriate for the activity or not provided. Sample grading rubrics absent.
Support Materials	Adequate support materials (e.g. references, student worksheets, answer keys) are provided.	Support materials (e.g. references, student worksheets, answer keys) vague or incomplete.	Support materials (e.g. references, student worksheets, answer keys) of poor quality or not provided.

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Ethics	Acceptable as submitted (1)	Needs modifications (2)	Fundamental revisions required (3)
Use of Human Subjects	The manuscript demonstrates appropriate data collection and/or the use of human subjects, such as informed consent and confidentiality.	The manuscript inadequately demonstrates appropriate data collection and/or the use of human subjects, such as informed consent and confidentiality.	The manuscript fails to demonstrate appropriate data collection and/or the use of human subjects, such as informed consent and confidentiality.
Acknowledgement	The authors have completely and properly cited the work of others from the primary literature.	The authors incompletely or improperly cite the work of others from the primary literature.	The authors have failed to cite the work of others from the primary literature.
Credibility			
Sample Data	Included are useful examples of actual student data and/or expected outcomes of the activity.	Included are examples of actual student data and/or expected outcomes of the activity that are incomplete or require clarification	Examples of actual student data and/or expected outcomes of the activity not provided.
Assessment	<p>The activity has been field tested at least twice and revised accordingly.</p> <p>Assessment methods are appropriate (e.g. more than student perception of learning) and are well connected to the stated learning outcomes.</p>	<p>The activity has been field tested once and revised accordingly.</p> <p>Assessment methods are suggested but are inappropriate (e.g. only student perception of learning) and/or are not well connected to the stated learning outcomes.</p>	<p>No reported field-testing.</p> <p>Assessment methods are absent.</p> <p>Assessment methods are not well connected to the stated learning outcomes.</p>
Claims and Conclusions	<p>Claims and conclusions are believable.</p> <p>Assessment data demonstrate activity is highly effective in</p>	<p>Claims and conclusions exaggerated or understated.</p> <p>Assessment data demonstrates activity has marginal</p>	<p>Claims and conclusions are not believable or are misleading.</p> <p>Evidence from field tests does not demonstrate effectiveness of activity</p>

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	meeting the learning objectives.	effectiveness in meeting the learning objectives.	to meet the stated objectives.
Organization and Other Qualities	Acceptable as submitted (1)	Needs modifications (2)	Fundamental revisions required (3)
Organization	The manuscript is clear, concise and well organized.	The manuscript is not clear or concise, but is well organized, OR the manuscript is concise, but not clear or well organized.	The manuscript is not clear, not concise and not well organized.
Modifications and Extensions	Appropriate modifications and extensions are suggested that broaden the activity to other audiences, themes, or applications.	Appropriate modifications are suggested that broaden the usefulness of the activity, but require clarification.	No modification or extensions are listed, although the activity clearly would benefit by their inclusion.
Supplemental Materials	Supplemental materials represent useful material that enhances the submission. Institution specific references absent.	Additional supplemental material would be useful and/or supplemental materials require clarification. Contain institution specific references.	Necessary supplemental materials absent and/or included supplemental materials seemingly not relevant to the quality of the activity. Contain institution specific references.

Overall Common Problems that Require Major Revision:

1. Activity is not novel, or closely duplicates a previously published activity.
2. Abstract is not concise or comprehensive.
3. Expected outcomes are not provided.
4. Results of field testing are not included; evidence of student learning is not provided.
5. Safety issues are not addressed.
6. Activity does not allow active learning (i.e., it is a 'cookbook' exercise).

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