

Journal of Microbiology & Biology Education Author Guidelines for Themed Manuscripts

Revised 9.13.2017

TABLE OF CONTENTS

| | |
|---|-------|
| <i>JMBE</i> Author Guidelines | 2-7 |
| Focus and Scope | 2 |
| Publication Frequency and Submission Deadlines | 2 |
| Ethical Guidelines..... | 2-3 |
| Copyright Notice..... | 3-4 |
| Peer Review Process | 4-5 |
| Types of Manuscript Formats Accepted for Themed Issues..... | 5 |
| Online Submission Procedures..... | 5-6 |
| Online Submission Checklist | 7 |
| Preparing a Research Manuscript | 8-11 |
| Preparing a Perspectives Manuscript | 12-15 |
| Preparing a Curriculum Manuscript | 16-21 |
| Preparing a Tips and Tools Manuscript | 22-25 |
| Preparing a Reviews Manuscript..... | 26-28 |
| Rubric for Themed Manuscripts | 29 |
| <i>JMBE</i> Author Agreement Form | 30-33 |

JMBE Author Guidelines

FOCUS AND SCOPE

The *Journal of Microbiology & Biology Education* (JMBE) publishes original, previously unpublished, peer-reviewed articles that foster scholarly teaching, and provide readily adoptable resources in biology education. JMBE welcomes thoughtful and supported submissions pertaining to scholarly teaching in undergraduate, graduate and professional (e.g., medical school) education, K-12 outreach, and informal education.

The scope of the journal is rooted in the biological sciences and its branches to other disciplines. Examples of articles JMBE accepts include those addressing good pedagogy and design, student interest and motivation, recruitment and retention, citizen science, faculty development, and institutional transformation.

A unique feature of the JMBE editorial process is to provide extensive feedback, guidance, and support for authors from submission through publication.

JMBE is sponsored by the American Society for Microbiology (ASM; www.asm.org), the oldest and largest single life science membership organization in the world, and is indexed in [PubMed Central](#), [CrossRef](#), and [DOAJ](#). The JMBE Editorial Board is committed to providing open access content.

PUBLICATION FREQUENCY AND SUBMISSION DEADLINES

One or more themed JMBE issues may be published each calendar year. Submission deadlines will be approximately 6 months prior to the publication, and are subject to change.

ETHICAL GUIDELINES

In recent years, editors of scientific journals increasingly have reported problems relating to the integrity of the research in submitted and published papers. Scientific errors and incorrect interpretations inevitably occur in the published literature, but authors who knowingly commit fraud or other scientific misconduct seriously compromise the integrity of the scientific record and the success of future scientific research.

Authorship. Regarding authenticity of authorship, only those individuals who contributed directly to the intellectual content of the paper should be listed as such, with the implication that all of the following criteria have been met by the author(s) listed: (a) conceived and planned the work that led to the report; (b) wrote the paper, or reviewed successive versions and took part in the revision process; and (c) approved the final version. Holding positions of administrative leadership, contributing clients, and collecting and assembling data, are not, by themselves, criteria for authorship. Other persons who have made substantial, direct contributions to the work but cannot be considered authors should be acknowledged with their permission.

Previous or Duplicate Publication. In “Comments to the Editor,” give full details on any possible previous or duplicate publication of any content of the paper. Previous publication of a small fraction of the content of a paper does not necessarily preclude its being published, but members of the Editorial Board need information about previous publication when deciding how to use space in the journal efficiently; they regard failure of full disclosure by authors of possible prior publication as a breach of scientific ethics. Please send a copy of any document that might be considered a previous publication via email to the Executive Editor, or provide this document during the submission process as a Supplementary file.

Preprint Policy. *JMBE* Editors will consider manuscripts for publication that have been posted in a recognized, not-for-profit preprint archive (such as bioRxiv), provided that upon acceptance of the manuscript for publication, the author is still able to grant ASM copyright or agree to the terms of an Open Access license. It is the responsibility of authors to inform the journal at the time of submission if and where their article has been previously posted. If the manuscript is accepted for publication in *JMBE*, authors are required to update the preprint with a citation to the final published article that includes the DOI along with a link.

Conflict of Interest Notification. Conflict of interest exists when an author, reviewer, or editor has financial or personal relationships that could inappropriately bias or compromise his or her actions (such relationships are also known as dual commitments, competing interests, or competing loyalties). More specifically, the following considerations are illustrative and would need to be addressed: (a) Authors should identify individuals who provide writing or other assistance and disclose the funding source for this assistance. (b) Investigators must disclose potential conflicts to study participants and should state in the manuscript whether they have done so. (c) Authors should describe the role of the study sponsor(s), if any, in the study design; in the collection, analysis, and interpretation of the data; in the writing of the report; and in the decision to submit the report for publication. If the supporting source had no such involvement, the authors should so state. (d) Editors may request that authors of a study funded by an agency with a proprietary or financial interest in the outcome sign a statement such as, "I had full access to all of the data in this study and I take complete responsibility for the integrity of the data and the accuracy of the data analysis."

Such perceived conflicts--or their absence in a study-- must be disclosed by the author via the "Comments to the Editor" route when the manuscript is submitted. Additionally, either the presence or absence of perceived conflicts must be addressed on a Conflict of Interest Notification Page that follows the manuscript's title page.

Project Funding. Sources of outside support for research, including funding, equipment, and drugs, must be named in the contributed manuscript. The role(s) of the funding organization, if any, in the collection of data, its analysis and interpretation, and in the right to approve or disapprove publication of the finished manuscript must be described in the Methods section of the text.

Informed Consent. The use of human subjects or other animals for research purposes is regulated by the federal government and individual institutions. Manuscripts containing information related to human or animal use should clearly state that the research has complied with all relevant federal guidelines and institutional policies.

Warranties and Exclusions. Articles published in this journal represent the opinions of the authors and do not necessarily represent the opinions of ASM. ASM does not warrant the fitness or suitability, for any purpose, of any methodology, kit, product, or device described or identified in an article. The use of trade names is for identification purposes only and does not constitute endorsement by ASM.

COPYRIGHT NOTICE

All individuals submitting materials for the *Journal of Microbiology & Biology Education* must attest that they own the copyright and the materials are original; this includes text, figures, tables, artwork, abstracts, cover images, summaries, and supplemental materials included in the submission. Furthermore, corresponding authors must grant the American Society for Microbiology (ASM) an irrevocable nonexclusive license to publish their work if it is accepted. Upon publication, the work becomes freely available on ASM's *Journal of Microbiology & Biology Education* website and PubMed Central's Open Access subset for the public to copy, distribute, or display under a Creative Commons Attribution-Noncommercial-NoDerivatives 4.0 International license (License: <https://creativecommons.org/licenses/by-nc-nd/4.0/>; Legal Code: <https://creativecommons.org/licenses/by-nc-nd/4.0/legalcode>).

Individuals authoring materials for *Journal of Microbiology & Biology Education* must grant an irrevocable nonexclusive copyright license to the American Society for Microbiology (ASM). Please complete the *Journal of Microbiology & Biology Education* Author Agreement Form (PDF) which can be found at the end of this document.

PEER REVIEW PROCESS

Peer-Review. All manuscripts are reviewed by the Guest Editors, members of the editorial board, and/or qualified ad hoc reviewers. There are two ways a manuscript may be reviewed: inside (preferred) or outside the *JMBE* system.

Manuscripts may be reviewed outside the *JMBE* system if they are personally solicited by the Guest Editors. Guest Editors will work with the author directly to review and revise the manuscript. Once accepted, the manuscript must be submitted to the *JMBE* system for production and publishing—see the “Online Submission Procedures” section below for instructions.

Manuscripts submitted directly to the *JMBE* system as a result of ASM’s open call for manuscripts will be shared with the Guest Editors and the *JMBE* Editorial Board should be reviewed inside the *JMBE* system.

NOTE: When a manuscript is returned to the corresponding author for modification, it should be returned to the Editor within the deadline specified by that Editor; otherwise it may be considered withdrawn. A point-for-point response to the reviews must be included with the revised manuscript; an extra copy of the revised manuscript should have the changes highlighted.

Any manuscript with a laboratory component will undergo review by *JMBE*’s Laboratory Safety Review Committee, prior to regular review. As a result, authors may be asked to make safety-related changes to their manuscript before it goes out for regular review. This review has been established to ensure that all laboratory practices comply with ASM’s [Guidelines for Biosafety in Teaching Laboratories](#) and to mitigate the risk to the students, faculty, and institutions who may be adopting the activity.

Manuscript Disposition. Manuscripts submitted directly to *JMBE* for review may be rejected upon receipt by the Editor-in-Chief and/or Guest Editors if they do not fit the scope of the journal, section, or theme. In this case, the manuscript will not enter the review process, is considered rejected, and the Author will be asked to review the “Author Guidelines for Themed Manuscripts” and appropriate theme topics more thoroughly before resubmitting.

Once a manuscript is deemed appropriate for review in the *JMBE* system, there are four possible final outcomes:

1. Editor enters a decision of “Decline Submission.” This indicates that the paper is not appropriate for publication and the Author will not be requested to resubmit. The manuscript will exit the system, marked as “Archived.”
2. Editor enters a decision of “Resubmit for Review.” This indicates that while the manuscript topic is engaging, there are major issues with formatting, inadequate data, or lack of assessment, among others. The manuscript will exit the system, marked as “Archived,” and the Author is requested to make extensive revisions based on Editor comments. The Author may submit a new manuscript when all reviewers’ concerns have been addressed. A new manuscript id number will be assigned upon receipt of the new submission.
3. Editor enters a decision of “Revisions Required.” This indicates that the paper is acceptable, but minor revisions are necessary. The manuscript remains “Active” in the system. The author will upload a revised manuscript*, along with a cover letter indicating the changes made. The revised manuscript will be reconsidered by the Reviewers, and a final decision will be made.

4. Editor enters a decision of "Accept Submission." The manuscript matches the focus and scope of the journal and is accepted for publication. It will move forward in the production process.

***NOTE:** When preparing revised manuscripts, it is essential to carefully follow the instructions given in the Editor's letter. In particular, provide an annotated copy of the manuscript as well as a cover letter that addresses, point-by-point, the concerns of the Reviewers. Failure to do so will cause a delay in the review of the revised manuscript and may result in its return. Revised manuscripts must be uploaded under the "Editor Decision" section, located at the bottom on the manuscript's Review page. Untimely revisions may be held for another review cycle or closed and archived, at the Editor's discretion.

TYPES OF MANUSCRIPT FORMATS ACCEPTED FOR THEMED ISSUES

Manuscripts submitted for a themed issue should follow the formatting of a typical Research, Perspectives, Curriculum, Tips and Tools, or Reviews manuscripts. Details about specific manuscript formatting for each of these sections are provided beginning on page 8.

ONLINE SUBMISSION PROCEDURES

Creating an Author Account. Before submitting a manuscript, authors must create a user account and check the "Author" box in their user profile. Once this box is checked, select the "Submit a Manuscript" button to the right and follow the prompts for submission. [Create a JMBE account.](#)

Author Tip. Authors should review journal articles in the section to which they plan to submit and make sure their manuscripts follow the formatting of those articles published in 2012 and beyond.

Submission Process. Authors can find additional guidance and step-by-step instructions for the submission process, as well as instructions for uploading revised manuscripts, in the "[Online Submissions](#)" section of the Author Guidelines page. Be sure to download and follow the PDF documents "How to Submit a Manuscript to JMBE" and "How to Submit a Revised Manuscript to JMBE."

Step 1: Start Submission. Under "Journal Section," a drop down menu allows the selection of type of article. The author should complete the submission checklist indicating the article is prepared in the proper format and has not been previously published. Use the optional "Comments to the Editor" section to report any previous or duplicate publication and/or conflict of interest (see General Guidelines). Select Save/Continue to proceed to the next section.

Step 2: Submission Metadata. The first, middle, and last name of each author, affiliation, and email address are required for each author. An optional biographical statement may be added for each author. Spaces are provided for the Submission Title and Submission Abstract. A space is provided for the author to name Agencies that provided support for the work presented in the submission.

Step 3: Submission Upload. Four steps are required to submit the manuscript, which must be saved on the hard drive of the Author's computer. 1. Click Browse to open a Choose File window for locating the manuscript on the hard drive. 2. Locate the submission file and highlight it. 3. Click Open on the window, which places the address in the box on this page. 4. Click Upload on this page, which uploads the file from the Author's computer to the journal's website and renames it following the journal's system. The file can be viewed by clicking on the file name. A new or revised file can be uploaded, deleting the one that currently appears. After clicking Upload, the upload window clears; click Save/Continue to move to the next step.

Step 4: Supplemental Files. An important feature of this publishing system is the ability to upload separate graphics files. Having graphics files separate from text files facilitates the HTML markup of the article for online viewing.

NOTE: Supplemental files including samples of student work, teacher versions for exercises, teacher research instruments, data sets, information sources, etc. *are not encouraged* for themed manuscripts. Relevant information should be included within the manuscript text only.

Step 5: Confirmation. This step allows the author to review the submission for completeness, note the file(s) name change in the system, note the submission file size, and upload date. **The author should click Finish Submission to confirm the upload.**

When a manuscript is submitted, it is given a number and sent to the editor. Corresponding authors are notified of this number. Always refer to this number in communications with the editor and *JMBE* staff. It is the responsibility of the corresponding author to inform the coauthors of the manuscript's status throughout the review and publication processes.

ONLINE SUBMISSION CHECKLIST

As part of the submission process, authors are required to check off their submission's compliance with all of the following items, and submissions may be returned to authors that do not adhere to these guidelines.

1. **ONLINE SELF-DIAGNOSIS TOOL:** The Author has used this tool to determine if their manuscript is ready for submission. Structured similarly to popular online quizzes, this tool helps authors understand the scope and level of assessment required by each section. [Diagnose Your Manuscript.](#)
2. **GUIDELINES FOR MANUSCRIPT TITLES:** The Author has used the following guidelines to help increase their manuscript's "discoverability" online, thus leading to a wider audience and increased citations. [Improve Your Manuscript Title.](#)
3. **JMBE How-To Series: Steps for Submitting a Manuscript to the Journal:** The Author has watched the 10-15 minute video tutorial that provides an overview of *JMBE* and its five sections, a walk-through of the submission process, and tips for a successful submission.
4. **CONTENT ADHERES TO AUTHOR GUIDELINES:** The text meets the journal's formatting requirements as outlined in the General Guidelines and specific Section Guidelines for the section to which the paper has been submitted.
5. **LABORATORY BIOSAFETY GUIDELINES:** The author has confirmed that any laboratory procedures and/or practices outlined in the submission adhere to the [ASM Guidelines for Biosafety in Teaching Laboratories.](#) Furthermore, the author has indicated in the submission how those procedures and/or practices adhere to the ASM Guidelines for Biosafety in Teaching Laboratories.
6. **PREVIOUS OR DUPLICATE PUBLICATION:** The submission has not been previously published, nor is it before another journal for consideration; or an explanation has been provided in "Comments to the Editor."
7. **FILE FORMAT:** The submission file is in Microsoft Word or RTF document file format.
8. **DOCUMENT FORMAT:** The text is double-spaced; uses a 10-point Times New Roman font or equivalent; employs italics, rather than underlining (except for URL addresses); with figures and tables placed at the end of the text, rather than embedded within.
9. **WEBSITE LINKING:** All URL addresses in the text are activated and ready to click.
10. **FIGURES AND TABLES:** Figures and tables are placed at the end of the text, rather than embedded within. They 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.**
11. **IMAGES:** All images are uploaded as Supplemental Files in JPG or GIF 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 included. Images are 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.**
12. **SUPPLEMENTAL MATERIALS:** Supplemental materials are loaded as one Word doc file. All materials are designated as Appendix 1, Appendix 2, etc., within the manuscript text and listed 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 linked Table of Contents will be provided for supplemental materials once the manuscript and associated supplemental materials have been accepted for publication in *JMBE*.
13. **REFERENCES:** References are listed in the order in which they are cited in the manuscript (citation-sequence reference system) and formatted according to [ASM Style.](#)
14. **INFORMED CONSENT:** The use of human subjects or other animals for research purposes is regulated by the federal government and individual institutions. Manuscripts containing information related to human or animal use should clearly state that the research has complied with all relevant federal guidelines and institutional policies.

Preparing a Research Section Manuscript

GENERAL GUIDELINES

Research articles typically report original, hypothesis-driven, scholarly research that addresses teaching and learning and other facets of science education. Articles that address social science or qualitative work are also welcome. Potential topics may include, but are not limited to, the following:

- Evidence-based learning activities and courses that have been rigorously evaluated through the systematic collection and analysis of assessment data
- Rigorous assessments of teaching delivery methods and/or approaches that enhance student learning in the sciences
- Scholarly work that describes how science students learn
- Student attitudes, motivations and other factors in STEM retention
- Validation of the outcomes of a particular strategy or program
- Student perceptions of value, self-efficacy, or understanding
- Evidence-based studies of program effectiveness or engagement in science education
- Assessment of learning activities, courses, and programs organized according to national standards and curriculum guidelines (e.g., recommended core curricula from ASM, HAPS, or APS for microbiology, anatomy, or physiology education, respectively, or concept inventories in biology, genetics, nature of science, and more)

Manuscript length: 1,500 to 4,000 words in length, including the abstract and excluding the references.

Manuscript Review Criteria. Reviewers are provided a special themed rubric to guide their assessment of a themed manuscript, which can be found in the [Focus and Scope](#) section of the Journal Policies tab. Authors are highly encouraged to review the rubric prior to submission.

Editorial Style. The editorial style of ASM journals conforms to 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. The ASM copyeditors and the *JMBE* production staff reserve the privilege of editing manuscripts to conform to the stylistic conventions set forth in the aforesaid publications and in these Author Guidelines. On receipt at ASM, an accepted manuscript undergoes an automated pre-editing, cleanup, and tagging process specific to the particular article type. To optimize this process, manuscripts must be supplied in the correct format and with the appropriate sections and headings. 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 or an RTF document file format.

Document Format. The text should be double-spaced; using a 10-point Times New Roman font or equivalent; employing italics, rather than underlining (except for URL addresses); with 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 placed at the end of the text, rather than embedded within. They 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 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 included. Images are 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. Inclusive of the following: information in the title that facilitates appropriate electronic article retrieval; authors' names, highest academic/professional degree(s), and institutional affiliation; appropriate contact information for the corresponding author(s); 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 Key Word 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 that will be attractive for today's online searching methods.

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.

- **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 — This first of four parts comprising the main body of the report provides the literature-based background or context of the research problem area, the significance of the problem, the purpose of the study couched in terms of the research question or objective, and the rationale for and statement of the research hypothesis.

METHODS — This part of the report's main body includes information pertinent to the selection and description of the participants; technical information regarding the operational methods,

apparatus/instrumentation, and procedures so as to allow replication of the study; and sufficiently-detailed statistical methods, inclusive of confidence interval and effect size calculations when possible to augment null hypothesis significance testing.

RESULTS — This part of the report's main body provides quantitative results via descriptive and/or inferential statistics as well as qualitative results where appropriate. The results should adhere to a logical and coordinated sequencing of text, tables, and illustrations, with an effort to avoid unnecessary repetition in the narrative of the data displayed in the tables and illustrations.

DISCUSSION — This fourth and final part of the report's main body focuses on new and important features of the study as well as the justifiable conclusions that follow from them. Rather than repeating data or other information from the earlier Introduction or Results sections, this section provides the following coverage: summarizing succinctly the main findings of the study; exploring plausible explanations or mechanisms of the findings; comparing and contrasting the results with other pertinent studies acknowledged earlier in the report; stating the limitations and delimitations of the study; and exploring the implications of the study's findings for future research and biology education practice.

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 — List references that would be especially suitable as background for faculty or supplemental material for students. References should be listed in the order in which they appear in the manuscript (citation-sequence reference system). This part of the report immediately following the manuscript's main body provides the bibliographic information for each and every source cited. Arabic numerals in parentheses serve to identify references in text, tables, and legends. Please review the [ASM Style Guide for References](#) provided, 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. In so doing, the reliance on reputable primary rather than secondary sources is obviously preferred. 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.

Preparing a Perspectives Section Manuscript

GENERAL GUIDELINES

Perspectives articles are aimed at placing into broader view a particular, current topic or problem **related to the theme**. Topics include, but are not limited to:

- Assessment methods
- Student engagement
- Curricular changes
- Faculty development
- K-20 and graduate and/or professional education
- Approaches to various educational challenges within the thematic area
- Current advances and future directions

The manuscript should: (1) identify the education problem or challenge by presenting referenced data to substantiate the problem or challenge; (2) describe previous scholarly attempts to address the problem; (3) although not the impetus for the article, how does the author's study or work address the problem or challenge and help resolve the issue; and (4) offer a viewpoint as to the next steps to be taken. With rare exceptions, Perspectives articles should have no more than two authors.

Manuscript length: 1,000 to 3,000 words, including the abstract and excluding the references.

Manuscript Review Criteria. Reviewers are provided a special themed rubric to guide their assessment of a themed manuscript, which can be found in the [Focus and Scope](#) section of the Journal Policies tab. Authors are highly encouraged to review the rubric prior to submission.

Editorial Style. The editorial style of ASM journals conforms to 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. The ASM copyeditors and the *JMBE* production staff reserve the privilege of editing manuscripts to conform to the stylistic conventions set forth in the aforesaid publications and in these Author Guidelines. On receipt at ASM, an accepted manuscript undergoes an automated pre-editing, cleanup, and tagging process specific to the particular article type. To optimize this process, manuscripts must be supplied in the correct format and with the appropriate sections and headings. 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 or an RTF document file format.

Document Format. The text should be double-spaced; using a 10-point Times New Roman font or equivalent; employing italics, rather than underlining (except for URL addresses); with 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 placed at the end of the text, rather than embedded within. They 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 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 included. Images are 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. Inclusive of the following: information in the title that facilitates appropriate electronic article retrieval; authors' names, highest academic/professional degree(s), and institutional affiliation; appropriate contact information for the corresponding author(s); 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 Key Word 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 that will be attractive for today's online searching methods.

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.

- **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 an overview of the topic, the impetus for writing the perspective, and the intended audience.

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 — List references that would be especially suitable as background for faculty or supplemental material for students. References should be listed in the order in which they appear in the manuscript (citation-sequence reference system). This part of the report immediately following the manuscript's main body provides the bibliographic information for each and every source cited. Arabic numerals in parentheses serve to identify references in text, tables, and legends. Please review the [ASM Style Guide for References](#) provided, 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. In so doing, the reliance on reputable primary rather than secondary sources is obviously preferred. 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.

Preparing a Curriculum Section Manuscript

GENERAL GUIDELINES

Curriculum articles describe innovative classroom and laboratory activities ready for adoption by instructors teaching biology. Detailed instructions for student 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 of learning objectives
- Suggest possible modifications and/or extensions

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

Manuscript Review Criteria. Reviewers are provided a rubric to guide their assessment of a manuscript. Authors are highly encouraged to review the rubric prior to submission. See pages 14-17 for the Curriculum Section Review Criteria.

Editorial Style. The editorial style of ASM journals conforms to 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. The ASM copyeditors and the *JMBE* production staff reserve the privilege of editing manuscripts to conform to the stylistic conventions set forth in the aforesaid publications and in these Author Guidelines. On receipt at ASM, an accepted manuscript undergoes an automated pre-editing, cleanup, and tagging process specific to the particular article type. To optimize this process, manuscripts must be supplied in the correct format and with the appropriate sections and headings. 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 or an RTF document file format.

Document Format. The text should be double-spaced; using a 10-point Times New Roman font or equivalent; employing italics, rather than underlining (except for URL addresses); with 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 placed at the end of the text, rather than embedded within. They 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 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 included. Images are 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. Inclusive of the following: information in the title that facilitates appropriate electronic article retrieval; authors' names, highest academic/professional degree(s), and institutional affiliation; appropriate contact information for the corresponding author(s); 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 Key Word 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. Include "classroom exercise" or "laboratory exercise" as appropriate.

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 that will be attractive for today's online searching methods.

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.

- **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. The introduction should provide the rationale for design of the curriculum activity, sufficient background information to allow the reader to evaluate the activity without referring to previous publications, and indicate whether the exercise is a classroom or laboratory 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.

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. If the activity is a longer exercise, consider alternate arrangements of activity units to allow the exercise to be completed in one long period or spread over several periods. Alternate activity timelines may also be described in the modifications section.

Prerequisite student knowledge. Indicate prerequisite knowledge and skills that students should have before using this activity. Prerequisite knowledge includes both laboratory skills and background knowledge needed.

Learning objectives. Provide a list of clearly stated learning outcomes. 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..." Well-written submissions will include assessment examples that directly test these stated learning objectives.

PROCEDURE — The procedure section includes all information needed to allow adopting instructors to repeat the activity with their classes. The procedure section 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 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. Please 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 of questions, assignments, and/or rubrics should 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 identifying names. 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. 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 "None."

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 (size of class, audience, etc.). Include student and faculty feedback so other faculty can better judge how this activity might work for them. 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 — List references that would be especially suitable as background for faculty or supplemental material for students. References should be listed in the order in which they appear in the manuscript (citation-sequence reference system). This part of the report immediately following the manuscript's main body provides the bibliographic information for each and every source cited. Arabic numerals in parentheses serve to identify references in text, tables, and legends. Please review the [ASM Style Guide for References](#) provided, 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. In so doing, the reliance on reputable primary rather than secondary sources is obviously preferred. 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) — Append any useful or needed information that does not fit easily into the categories above as appendices. Supplemental materials are loaded as one Word doc file. All materials are designated as Appendix 1, Appendix 2, etc., within the manuscript text and

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

Preparing a Tips and Tools Section Manuscript

GENERAL GUIDELINES

Manuscripts in this journal section describe practical, technical, and feasible advice for improving teaching and learning **as related to the theme**. Brief, novel, ready-to-use best practices for teaching theme concepts are welcome. Articles in this section present quick ideas and practices that have not been rigorously tested. Assessment of the topic is welcome but NOT required.

Topics for Tips and Tools may include, but are not limited to:

- Novel classroom, laboratory, or field activities
- Independent project ideas
- Service learning ideas
- Class management approaches
- Assessment tools
- Career education
- Outreach activities

Manuscript length: 800 to 1,100 words in length, not including the abstract or references, with the goal of the text and figures fitting on two printed pages. The abstract must be submitted as part of the original manuscript, but will be published in the article metadata only. Supplemental materials (e.g., student instruction handouts, directions for preparation, and the like) may be submitted and are not included in the word limit.

Manuscript Review Criteria. Reviewers are provided a special themed rubric to guide their assessment of a themed manuscript, which can be found in the [Focus and Scope](#) section of the Journal Policies tab. Authors are highly encouraged to review the rubric prior to submission.

Editorial Style. The editorial style of ASM journals conforms to 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. The ASM copyeditors and the *JMBE* production staff reserve the privilege of editing manuscripts to conform to the stylistic conventions set forth in the aforesaid publications and in these Author Guidelines. On receipt at ASM, an accepted manuscript undergoes an automated pre-editing, cleanup, and tagging process specific to the particular article type. To optimize this process, manuscripts must be supplied in the correct format and with the appropriate sections and headings. 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 or an RTF document file format.

Document Format. The text should be double-spaced; using a 10-point Times New Roman font or equivalent; employing italics, rather than underlining (except for URL addresses); with 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 placed at the end of the text, rather than embedded within. They 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 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 included. Images are 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. Inclusive of the following: information in the title that facilitates appropriate electronic article retrieval; authors' names, highest academic/professional degree(s), and institutional affiliation; appropriate contact information for the corresponding author(s); 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 Key Word 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. 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 that will be attractive for today's online searching methods.

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.

- **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 — Introductory material should include the audience for which the tip is intended, and whether the tip is specific to classroom or laboratory (or both). A brief description of the tip is appropriate.

PROCEDURE — The body of the article should describe materials and methods, and information on how to make the tip work in the classroom or laboratory. Helpful hints or caveats for the instructor and students are desirable.

Safety issues. Address all safety issues faculty and students need to know when attempting this activity. 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 "None."

CONCLUSION — Comments on results of field testing of the activity or tip are appropriate here. Although assessment is not required, results of assessment may be included. Student comments are welcome.

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. Note: When an activity or tip has been presented elsewhere, even in preliminary form (for example a poster at a conference such as the [American Society for Microbiology Conference for Undergraduate Educators](#)), it is imperative to note such prior publication in an acknowledgement or reference, as appropriate. Thus search results for *JMBE* may produce two results, one as a conference proceeding, and another as a manuscript.

REFERENCES — List references that would be especially suitable as background for faculty or supplemental material for students. References should be listed in the order in which they appear in the manuscript (citation-sequence reference system). This part of the report immediately following the manuscript's main body provides the bibliographic information for each and every source cited. Arabic numerals in parentheses serve to identify references in text, tables, and legends. Please review the [ASM Style Guide for References](#) provided, 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. In so doing, the reliance on reputable primary rather than secondary sources is obviously preferred. 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.

Preparing a Review Section Manuscript

GENERAL GUIDELINES

Review manuscripts provide constructive critique of material that facilitates understanding **about the theme**. More than a descriptive overview, a useful review compares the text edition or digital resource to previous versions or similar alternatives, in a way that helps the potential adopter make an informed choice.

- Manuscripts may include reviews of new books, textbooks, videos, digital resources, or other multimedia of use within the thematic area.
- Suggestions for items to be reviewed are accepted throughout the year and must include the title, author, publisher, and distributor information, including cost.
- Reviews of journal articles (Journal Watch) and websites (Web Watch) are welcome.
- Especially helpful is if the reviewer has used the text or resource and can include details or specific examples of sections, activities, or programs they found either well-done, marginal, or of little help.
- All reviews need not be glowingly positive and in some cases the Editor may request a "point" and "counterpoint" opinion from more than one reviewer.
- The goal will consistently be to provide useful and trustworthy information about resources, particularly for educators who are struggling to choose among a myriad of available options.

Manuscript length: 500-600 words in length.

Manuscript Review Criteria. Reviewers are provided a special themed rubric to guide their assessment of a themed manuscript, which can be found in the [Focus and Scope](#) section of the Journal Policies tab. Authors are highly encouraged to review the rubric prior to submission.

Editorial Style. The editorial style of ASM journals conforms to 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. The ASM copyeditors and the *JMBE* production staff reserve the privilege of editing manuscripts to conform to the stylistic conventions set forth in the aforesaid publications and in these Author Guidelines. On receipt at ASM, an accepted manuscript undergoes an automated pre-editing, cleanup, and tagging process specific to the particular article type. To optimize this process, manuscripts must be supplied in the correct format and with the appropriate sections and headings. 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 or an RTF document file format.

Document Format. The text should be double-spaced; using a 10-point Times New Roman font or equivalent; employing italics, rather than underlining (except for URL addresses).

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

Abstract. Review article abstracts must be included below the title and follow the format “**Review of:** [formatted reference of article, resource, etc.]”

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 that will be attractive for today’s online searching methods.

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.
- **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.

JMBE Themed Issue Rubric

The *JMBE* themed issues are an opportunity to explore a current topic in detail. Often, the topics are interdisciplinary in nature, thus expectations of format are loosened from the traditional *JMBE* manuscripts. While we expect the same high quality of content, please do not get bogged down in whether the submission is a “typical” *JMBE* manuscript (Curriculum, Tips and Tools, Perspectives, etc.). Rather, consider the following questions:

1. How well does the submission fit the open call for the themed issue?
2. Would this manuscript be of interest to *JMBE* readers and the wider biology education community?
3. Could the approach outlined in the manuscript be adopted by others?
4. Is there sufficient review of the literature to have a solid basis for the claims made in the manuscript?
5. Are there any safety concerns about the approach utilized in the manuscript? Have the authors obtained IRB approval and/or followed ASM's Laboratory Safety Guidelines (<http://www.asm.org/index.php/educators/laboratory-safety-guidelines>)?
6. Is the manuscript formatted to *JMBE* guidelines for the themed issue (http://jmbesubmissions.asm.org/asm/pages/files/JMBEAuthorGuidelines_ThemedManuscripts.pdf)?
7. Other comments.