

## INSTRUCTIONS TO AUTHORS

### SCOPE

*Microbiology Education* publishes manuscripts of hypothesis-driven research in the area of student learning and other facets of microbiology education including, but not limited to:

- outcome-based learning activities and courses that convey important concepts about the microbial world, microbial processes, or techniques used to study microorganisms;
- outcome-based learning activities, courses, and programs in the microbiological sciences that are driven by societal issues;
- outcome-based learning activities, courses, and programs organized according to the American Society for Microbiology (ASM) recommended core curriculum for introductory microbiology;
- assessment of student learning in the microbiological sciences; and
- assessment of teaching techniques and/or program effectiveness in the microbiological sciences.

Papers presenting information on courses, curricula, or learning activities must include an evaluation of the technique or activity. Evaluation of a particular course, technique, or activity can manifest itself in different ways depending on the activity, the instructor, and the number and type of students. A central goal of this publication is to increase the recognition of scholarly efforts in microbiology education.

### REVIEW CRITERIA\*

*Worthwhileness.* The relevance of a hypothesis-driven research study in microbiology education is of paramount importance in any attempt to judge its quality. The hypothesis, which clearly states the problem investigated through the research, should be framed by the potential of the study for adding to and deepening our understanding of issues associated with microbiology teaching and learning. In general, research that leads the field in new directions is often more worthwhile than replications of existing research studies. This is most effectively communicated when accompanied by assessment of the learning outcomes, teaching effectiveness, etc.

We recognize that evaluations of worthwhileness can be quite difficult to do and are subject to extreme bias on the part of the evaluator. Nevertheless, rather than allowing tacit judgments of worthwhileness to establish directions for microbiology education research, it is preferable to make judgments of worthwhileness open to public scrutiny.

*Coherence.* Thoughtful researchers first give serious attention to identifying interesting and worthwhile research questions and then to selecting the research methods and techniques that best fit the nature of those questions. A potential problem of manuscripts is the mismatch between the research question and the research methods and analysis techniques employed to answer the question.

*Competence.* It is not enough that a research study involve relevant, interesting questions and be carefully conceptualized, designed, and reported. The conduct of the study itself must include the effective application of appropriate data collection, analysis, and interpretation techniques. Principles (some tacit, others explicit) for conducting interviews, designing instruments, reducing data, selecting samples, etc. have been developed within various disciplines to guide researchers in carrying out their studies. Although these principles should not be followed slavishly, competent researchers always consider them in order to ensure that every aspect of their studies is appropriately and carefully carried out.

*Openness.* Openness involves two qualities. First, in planning and conducting their investigations, good researchers are cognizant of the personal biases and assumptions that underlie their inquiry and, to the extent that it is possible to do so, they make these biases and assumptions public. Second, the conceptual/theoretical bases for a study and the research methods and techniques used should be described in sufficient detail to allow the research community to scrutinize them thoroughly. In reporting research results, the researcher should provide the reader with a clear sense of how the data were collected, what data were used to make interpretations, and how the data were analyzed.

*Ethics.* Considerations of ethics cannot be ignored in establishing criteria for judging research in microbiology education. These considerations have to do with two concerns: 1) the manner in which the research has been conducted in relation to the research subjects (often students or teachers), and 2) acknowledgment of the contributions of others. The first concern involves matters such as informed consent, confidentiality, and accurate portrayal of situations and persons involved in the research. The second concern includes acknowledgment of the contributions of all persons who contributed to the research project, as well as open recognition of individuals whose research has influenced the present research.

*Credibility.* This criterion has to do with the extent to which sensible, thoughtful, and open-minded readers find the claims and conclusions made in a research report believable. That is, the claims made and conclusions drawn should be justified in some acceptable way. Moreover, the arguments and interpretations provided in a research report should be presented in a manner that makes it possible to verify or refute the conclusions drawn. Here the openness and credibility criteria intersect and support each other. In addition, it must be clearly stated that the tested hypothesis is substantiated by previous relevant credible research and referenced as such in the report.

*Other Qualities of Good Research Reports.* A research report that is lucid, clear, and well organized is likely to be more valuable and useful than one that does not possess one or more of these qualities. Similarly, the research community usually values conciseness over verbosity and directness over obscurity.

Originality is another example of a quality that sets good research apart from other types. An original study is not necessarily one that has never been done before. Rather, originality can also result from looking at an old question in a novel manner: using a new technique of analysis, synthesizing evidence in a different way, or providing a new interpretation for old data.

\*(Excerpted and adapted from "Criteria to Evaluate Research", Frank K. Lester, Jr., *Journal for Research in Mathematics Education*, Volume 27, Number 2, 130-132. March 1996. <http://www.nctm.org/jrme/info/criteria.to.evaluate.html>)

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- Format references in ASM style (see below for details)

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## Style Guide for References

### Published Journal Articles:

**Lowry, O. H., N. J. Rosebrough, A. L. Farr, and R. J. Randall.** 1951. Protein measurement with the Folin phenol reagent. *J. Biol. Chem.* **193**:265-275.

### Online version of print journal:

**Linde, E.** 1999. History of clinical microbiology. *Clin. Microbiol.* **100**:123-234. [Online.]

### Online-only journal:

**Taylor, P.** 2 October 1998, posting date. History of virology. *Am. Virol. J.* **1**:30-75. [Online.] <http://www.avj.html>.

### Published Books:

**Wagner, R. R., and J. K. Rose.** 1996. *Rhabdoviridae: the viruses and their replication*, p. 1121-1135. In B.N. Fields, D.N. Knipe, and P.M. Howley (ed.), *Fields virology*, 3rd ed. Lippincott-Raven Publishers, Philadelphia, Pa.

**Miller, J. H.** 1972. Experiments in molecular genetics, p. 23-56. Cold Spring Harbor Laboratory, Cold Spring Harbor, N.Y.

### Online versions of books:

**Brown, S. J.** 4 October 1998, posting date. Culturing methods, p. 750-800. In G. Xavier (ed.), *Practical procedures for the laboratory*, 5th ed. [Online.] DEF Publishing Co., Boston, Mass. <http://ppldef.idn/uk>.

### In-Press Books:

**Carson, P. L., and B. T. McInerney.** The nosocomial spread of disease. In R. R. Jones, R. N. Porter, and D. L. Hanley (ed.), *Epidemiology*, 3rd ed., in press. Smith Science Press, Boston, Mass.

### In-Press Journal Articles:

**Cox, C. S., B. R. Brown, and J. C. Smith.** Homolog of *Drosophila* *ahc* gene in humans. *J. Gen. Genet.*, in press.

### Conference Proceedings:

**Green, P. N., D. Hood, and C. S. Dow.** 1984. Taxonomic status of some methylotrophic bacteria, p. 251-254. *In* R. L. Crawford and R. S. Hanson (ed.), *Microbial growth on C<sub>1</sub> compounds*. Proceedings of the 4th International Symposium. American Society for Microbiology, Washington, D.C.

**More, J., and P. Galtier.** 1978. Embryotoxic and teratogenic effects of ochratoxin A in rats, p. 321-326. *In* E. Klika (ed.), *XIXth Morphological Congress Symposia*. Univerzita Karlova, Prague, Czech Republic.

Theses and Dissertations:

**Brown, S. J.** 1989. Ph.D. dissertation. University of Massachusetts, Boston.

**Daly, C. A.** 1991. Effects of spiramycin on *Toxoplasma gondii*. M.S. thesis. Boston University, Boston, Mass.

Government Publications:

**Goehring, H. K., and P. J. Van Soest.** 1970. Forage fiber analyses. Apparatus, reagents, procedures, and some applications. U.S. Department of Agriculture agricultural handbook no. 379. U.S. Department of Agriculture, Washington, D.C.

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...has also been found (R. Preston, H. Keel, and G. MacRae, submitted for publication).  
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...in mitochondria (S. DeWit, C. Thious, and N. Clumeck, Abstr. 34th Intersci. Conf. Antimicrob. Agents Chemother., abstr. 114, 1994).  
...as noted by Barton and colleagues (B. Barton, G. Harding, and A. Zuccarelli, Abstr. 94th Gen. Meet. Am. Soc. Microbiol. 1994, Abstr. H-249, p. 244, 1994).

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