

Integration of Information Fluency into a Two-Semester Introductory Biology Laboratory Series

Personnel

Project Director: Gary Lindqueter, Associate Professor of Biology
Rhodes College
2000 North Parkway
Memphis, TN 38112
(901) 843-3564; (901) 843-3565 (fax)
glindqueter@rhodes.edu

Other Participants: Robert Johnson, Dean of Information Services
John Olsen, Associate Dean of Academic Affairs
Darlene Brooks, Electronic Resources Librarian

Jay Blundon, Assistant Professor of Biology
Terry Hill, Associate Professor of Biology
Alan Jaslow, Assistant Professor of Biology
Carolyn Jaslow, Associate Professor of Biology
David Kesler, Associate Professor of Biology
Mary Miller, Assistant Professor of Biology
Charles Stinemetz, Associate Professor and Chair of Biology
Tony Becker, Visiting Assistant Professor
Romi Burks, Faculty Fellow

Abstract

This project is a follow-up to a 2000 ACS Information Fluency proposal on Fostering Information Fluency in the Introductory Biology Laboratory. That project involved modifying exercises that had been in practice for several years and integrating library instruction and pre- and post-course assessment of the information fluency of some 120 students enrolled in one semester of introductory biology. The course will be taught in the Spring of 2002, so the work is still ongoing at the time of this writing. However, since last year's proposal, a unique opportunity has presented itself. The Department of Biology is restructuring its introductory curriculum and is preparing to develop entirely new syllabi for its two-semester introductory laboratory series. Herein, we propose a half/day workshop that would function to focus discussion and foster ideas on how to fully integrate the objectives of the information fluency initiative into the laboratory exercises and assignments. We will also continue the use of an entrance survey assessing information fluency background and skills, and an exit survey assessing the success of the program in advancing those skills that will begin this spring. The ongoing assessment will provide extended data with a similar population of students to better monitor programmatic success. The model we develop will serve to inform other departments at Rhodes and ACS member institutions. Workshop format and materials and final syllabi will be readily available and exportable.

Rationale

In last year's proposal, we argued that where once educators could direct students to the written word with some faith in the process of review that preceded its publication, now, with the advent of the internet, educators must train students to assess the validity of that word themselves. Clearly, critical evaluation of source material is a major component of the information fluency initiative. However, we have been remiss in our efforts to date to address even some of the more basic issues. A week ago, David Kesler sent an email around the Rhodes Biology Department in which he stated, "Given my experiences this semester, from conversations with colleagues, and the article in the Chronicle, I think we should devote a whole lab to 'Library Basics' including, what is primary literature, where is the library, what resources are in the library, where does one start to do literature searches, what resources are provided on-line by the library, what is interlibrary loan? Whatever we've done in this regard has missed the mark for too many students."

In a three-day workshop at the end of the last academic year, the Department of Biology discussed many aspects of its curriculum and developed a plan for change. First and foremost on the agenda was the introductory biology series. While the specifics of the change are irrelevant to this proposal, what is significant is that we have gained approval for a new two-course introductory series and will be working to develop the laboratory syllabi next semester. Many in the department may debate the merit of devoting an entire lab specifically to the subject of "library basics", as David Kesler suggested. However, we do agree that as we work to formulate our new introductory lab series, an important consideration is how to integrate into these core courses the instruction of library basics, information hierarchy in biology, critical evaluation of sources, reference rules and formats, presentation, and other issues related to information fluency.

One of the overriding goals of our introductory lab courses will be to provide students with an understanding of and practice in the scientific method. This includes the ability to find and evaluate secondary and primary (peer-reviewed) information and use that information in supporting hypotheses and conclusions; to conduct experiments and analyze results; to present results and conclusions verbally and in writing, and to appropriately document and reference information. We have already proposed general structures to the courses to reach these goals. (See Appendix of tentative course syllabi.) However, this project will allow us to expand the discussion begun among a few members of the department this year to the entire department. Furthermore, it will foster that discussion at the beginning of the development of practical courses that will reach a combined enrollment of about 240 students per year.

Project Description

Workshop on Integration of Information Fluency into a Two-Semester Introductory Biology Laboratory Series - all sessions led by the principal investigator unless otherwise noted.

Workshop will be held on a Friday afternoon when participants have no other scheduled obligations. It will be held as early as possible in the semester, perhaps in early February. The tentative workshop schedule is as follows.

11:30-12:00 Participants in the workshop will be provided with the ACS definition of Information Fluency and the ACRL Information Literacy Standards for review prior to the workshop. Introductory remarks and discussion will focus on the

definition and how these issues have been addressed in the introductory course sequence in the past. The structure of the workshop will be presented.

- 12:00-1:00 What skills must our biology students have? Group discussion centered on the ACRL Standards and the proposed course goals will result in a specific list of skills we will require of our students upon culmination of the course.
- 1:50-2:10 What skills are our students coming in with and what skills must we teach them? Group discussion will divide the list into two parts. The remainder of the workshop will address the skills we must teach them.
- 2:10-3:10 Darlene Brooks will lead a presentation and discussion of the library's perspective on what skills the students are coming in with and how the library can assist with developing skills that students lack.
- 3:10-3:30 Break
- 3:30-4:30 Breakout sessions on how we can help students develop the skills they lack within the introductory course curriculum. The tentative format will be to have three concurrent breakout sessions, one each related to accessing information, evaluating information, and using information. Accessing information includes library skills; evaluating information includes information hierarchy in the field of biology and determining the validity of print and on-line sources; using information includes formulating hypotheses, providing background to proposed studies, formatting citations, and presenting results. A faculty volunteer will lead each session.
- 4:30-5:00 Presentation and discussion of the breakout session results and how the resulting ideas might be integrated.

Followup and Outcome

Participants will adjourn the workshop with a charge to work within two subcommittees devoted to the specific lab syllabi. The subcommittees will continue discussions begun at the workshop and include recommended exercises into the course structure. The subcommittees will report at weekly departmental meetings. The immediate outcome will be course syllabi and exercises that integrate the various goals on information fluency into a two-semester laboratory course that is required of all biology majors and is also taken by many non-science majors. The discussion on information fluency begun in the workshop will also inform and influence pending discussions on the upper level course curriculum and the senior seminar. The ultimate outcome will be faculty more in tune to issues and concerns of information fluency and students who are more information fluent.

Assessment

Bob Johnson, Dean of Information Services, and Gary Lindquister, the principal investigator, are developing a Web-based entrance survey to be administered to students during the first week of Zoology Laboratory for the spring 2002 semester. The survey will address relevant skills and knowledge such as those outlined in the ACS Guidelines for Information Fluency and the ACRL, Task Force on Information Literacy Standards documents. The results will serve as a base line

from which to measure success of the exercises in promoting information fluency and as a reference to inform future modifications of the exercises. At the end of the semester, students will complete an exit survey to assess the program's success. For the project proposed herein, the surveys will be modified as necessary to address issues arising in the workshop. These surveys will be administered in subsequent years to provide an ongoing record of incoming student preparation in information fluency and to monitor the success of instruction in information fluency.

Dissemination

All instructional materials and exercises will be posted locally on a course Web page. The URL for the Web page will be available for posting on the ACS Information Fluency web site. A report on the entrance and exit surveys will be provided via ACS, also. If appropriate, a report on the program will be made at a subsequent ACS Information Fluency symposium. We will also consider presenting at a national Council on Undergraduate Research meeting. Finally, our experience may allow us to adapt the approach for a broader, interdisciplinary audience and sponsor a workshop on integrating Information Fluency into introductory courses for majors in other disciplines. Such a workshop could serve both the Rhodes community as well as invite participation by others in the ACS community.

Appendix

BIOLOGY I LAB (Bio 140)

The goals of the laboratory are to ensure that the students have a firm introduction to a certain basic set of laboratory skills, which we understand will be reinforced and expanded in the second semester lab. We have two categories of “skills” in mind: 1) certain very basic laboratory practices, including gravimetric and volumetric measurement, aseptic technique, and analytical methods as exemplified by (for instance) chromatography, electrophoresis, and spectrophotometry; and 2) skills in experimental design, data analysis, and presentation. In addition, we would aim to initiate them to certain research “understandings”, such as that molecules can be manipulated as populations (e.g., via chromatography or electrophoresis), that cells can be disassembled and manipulated (again, on a population level), and that biochemical processes can be manipulated and analyzed in vitro.

We plan to have three laboratory experiences over the course of 12 meetings. These experiences will be of graded difficulty, mindful of the fact that this is the introductory lab experience for our students. We have not yet decided upon the exercises or how we’ll use them. A general sense of what’s meant by “graded difficulty” is given by the following hypothetical organization.

- Week 1: Learn a basic research skill.
- Week 2: Repeat independently with all groups performing a single variation.
- Week 3: Presentation in poster form.
- Week 4: Learn a more advanced analytical technique.
- Week 5: Repeat in a system differing significantly from the model learned the week before, but choosing from a limited range of possible variables.
- Week 6: Demonstration/discussion of basic PowerPoint presentation techniques and appropriate data analysis techniques.
- Week 7: PowerPoint presentations in lab.
- Week 8: Learn a more sophisticated analytical technique.
- Week 9: Formulate proposals for independent investigations based on this technique, and in-lab discussion of library research skills and scientific writing.
- Week 10: Independent work according to proposal.
- Week 11: Independent work according to proposal.
- Week 12: Submission of formal laboratory report, written in the scientific format.

BIOLOGY II LAB (Bio 141)

- Week 1. Introduction to Plants:** students learn basic plant anatomy/function and begin an experiment on plant growth using fast plants (plant seeds in lab).
- Week 2. Diversity:** students learn the macro- and microscopic characteristics of different organisms and the adaptations of organisms to different conditions (size, habitat, etc); develop skills in identification, dissection and microscopy,
- Week 3. Diversity continued.**
- Week 4. Fast Plant Data Analysis:** students harvest fast plants and discuss the procedure for data reduction. Lab practical quiz on plant anatomy/function and diversity.
- Week 5. PowerPoint Presentations:** student groups give PowerPoint presentations on fast plant experiments
- Week 6. Animal Embryology:** students examine specimens and learn early embryonic stages in amphibians. Student groups get embryos for 1-week experiments.
- Week 7. Animal Embryology Data Analysis and Interpretation:** student groups share their data, analyze it, then present their graphs and interpretations to the class. Practical quiz on Embryology.
- Week 8. Physiology I:** students test hypotheses regarding cardiac function in frogs. Students also learn cardiovascular anatomy and physiology.
- Week 9. Physiology II:** students test hypotheses in areas of physiological ecology or homeostasis. Brief lab write-up for Physiology I due.
- Week 10. Behavior:** students learn about the study of behavior and test hypotheses about animal behavior. Brief lab write-up for Physiology II due.
- Week 11. Ecology:** students learn field techniques and test a hypothesis about community structure. Brief lab write-up for Behavior due. Student groups get instructor approval for independent experiments to be conducted in the next week (see below).
- Week 12. Independent Experiments in Behavior or Ecology:** students work in groups to test their own hypotheses in one of these areas.
- Week 13. Poster Presentations:** student groups give poster presentations on their behavior or ecology experiments.