Information Literacy Integration & Assessment in Undergraduate STEM Programs

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Funding level requested: **Phase II**
Duration of funding period: **2 years**
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**Purpose**

In this project, we propose to analyze student-learning data gathered as part of a larger project to develop a program-level assessment of undergraduates’ information literacy skills. The analysis of these data will inform adjustments to course-based exercises and assessments to improve student learning in target STEM courses. Furthermore, this SOTL proposal requests funds to allow the investigators to attend national conferences to disseminate the results of our work.

This SOTL grant will supplement a grant to the investigators in November 2012 from the Alfred P. Sloan Foundation and the Teagle Foundation via the Council of Graduate Schools (CGS) and the University Graduate School at IU to develop new approaches for enhancing graduate student skills and understanding in the assessment of undergraduate learning.

The collaboration among the investigators will build upon previous successes in engaging science graduate students in course-based learning assessment to explore models for program-level assessment. The graduate students in this project will develop an assessment model with a strong focus on authentic learning to measure STEM learning outcomes at the individual, course, and program levels in Biology. Participating graduate students will facilitate the integration of concepts, exercises, and assessments throughout the undergraduate curriculum, from introductory through advanced biology courses. This model of curriculum development and assessment will be adaptable to a variety of learning outcomes and disciplines, and participating graduate students will regularly communicate results and best practices to students and instructors in other STEM programs at IU and beyond.

To this end, the investigators, along with Katie Kearns (CITL), have founded a program called Science Education Assessment (SEA) Scholars which will serve as the core team for program level integration and assessment of information literacy-based exercises. The SEA Scholars, all Biology graduate students, have been recruited and work is under way. Implementation of the model is scheduled for Fall 2013, and the SEA Scholars are preparing by meeting weekly with the investigators to learn about science pedagogy, information literacy, assessment principles and methods, and best practices for course and assignment design.

While the CGS grant allows us to focus on preparing future faculty, the broader goals of our work are focused more on improving teaching and learning of undergraduate students. The investigators will be applying for a National Science Foundation grant in May to extend and expand our work into a full-scale longitudinal, trans-disciplinary study of integration and assessment. Additional support from SOTL at this time would bridge our current work with our broader goals by allowing SEA Scholars to focus specifically on using student assessment data in order to revise and improve student learning in targeted STEM courses. Also, CGS funding does not provide support for dissemination-related travel, an essential project component for the investigators and the participants.

**Previous Research Results and SOTL-Related Publications/Presentations**
Much of the local research on information literacy integration and assessment has been funded or supported by the Scholarship of Teaching and Learning in some way. The results of the various studies have all been considered and drawn from to develop this current project in a way that will make it as effective as possible. Some of the most relevant and important results are summarized here:

- Integrating information literacy principles into the research and writing process empowers students by teaching them expert-level skills in their information use. It also by nature makes writing a deliberate and process-based endeavor. Rubric assessment of writing samples has shown that this approach results in better organization of thoughts and information, and better writing overall. Student subjects often report that information literacy-based exercises make them feel confident, creative, and professional.
- Information literacy is often seen as the domain of librarians, but research shows that collaboration is crucial in successfully producing information literate students. Information literacy principles become most meaningful in the context of a discipline, so librarians and instructors in disciplines must work together for best results.
- Assessment of student learning is most meaningful when it is authentic. Rubric assessment has shown to be a viable and effective option for authentically assessing information literacy-based student work. (Co-investigator Winterman was involved in a federally-funded study called Rubric Assessment of Information Literacy Skills (RAILS) and co-presented with Dr. Megan Oakleaf in 2012 for the SOTL community.)

The following recent publications resulted from work supported by SOTL:


Donovan, C., Slough, R., & Winterman, B.(2011). Information Literacy for Multiple Disciplines: Toward a Campus-Wide Integration Model at Indiana University, Bloomington. *Communications in Information Literacy*, 5, 1: 38-54.


**Significance and Impact**

It is expected that results of this project will have significant impact locally and beyond in several regards:
• Once fully implemented, our model of information literacy integration in the Biology department will ensure that all majors learn key skills at the right time along their path through their program. Students graduating with an undergraduate degree in biology should be prepared to engage, communicate, and think like a biologist.

• The SEA Scholars program and the implementation of the information literacy integration model will directly impact most instructors and required courses in the major in the Biology department (and hopefully others). The SEA Scholars will act as consultants to instructors and these relationships will presumably result in more effective and thoughtful teaching throughout the program.

• This project promotes an assessment model that is flexible and manageable, and should be effective at the course and program levels. Assessment plans with these characteristics are highly desirable to other programs on campus and beyond.

• This model is based on information literacy standards, which are designed to address any disciplinary environment, so the model should be easily adoptable by most other programs on campus. Widespread adoption would result in university-wide engagement with meaningful teaching and learning assessment.

• Participating graduate students will gain valuable experience far beyond their traditional roles as assistant instructors. They will, in effect, become scholars of the teaching and learning assessment endeavor. As most will teach professionally in some capacity in the future, their experience in this program will benefit students in future classes at IU and at other institutions.

**Research Methodology**

We will evaluate the SOTL-funded portion of the project in a number of ways focusing primarily on course and program level rubric assessment data, the implementation of the program-wide plan, and the collaboration and communication between participants and instructor. This analysis will include the following assessments:

• Course-level rubrics used in targeted courses will provide data on student performance in information literacy exercises. These data will be compiled to identify strengths and weaknesses in attaining overall program goals.

• A program-level report summarizing student learning outcomes will serve as windows into opportunities for revising and improving exercises and assessment tools at the course level.

• Ongoing electronic course portfolios will provide valuable evidence of SEA Scholars’ progress related to exercise design and assessment and their grounding in sound pedagogical principles and content knowledge.
  o Course-level exercises, assessments, and rubrics
  o Reflection on the integration of these course-level exercises and assessments within the larger undergraduate science curriculum

**Dissemination**

The investigators will report progress and results as appropriate via publishing and presenting in both local and national publications/conferences. Also, the graduate student participants will be
expected to publish and present the results of their student learning assessment locally and nationally. Following is a list of potential audiences for dissemination:

- Biology faculty and instructors
- SOTL community
- Library faculty and staff
- College of Arts & Sciences
- State and national conferences in science education and library science

**Reflective Teaching**

This project by nature encourages and offers a viable structure for reflective teaching for SEA Scholars and instructors. By having them examine courses in the context of the entire program, and assessing student learning at both the class and program level, they will see how learning in one class affects another, and they will likely never view a single class or the teaching practices employed therein as a standalone experience for the student or instructor again.

**Budget Narrative**

Additional project funding is needed to extend participant stipends for up to a semester after CGS funding expires in order to focus on analysis of student learning assessment data and to pay for presentation-related travel for the investigators and participants.

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<thead>
<tr>
<th>Stipends:</th>
<th>$2,400.00 (3 grad students at $800 each)</th>
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<tr>
<td><strong>Total:</strong></td>
<td><strong>$5,000.00</strong></td>
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**Research Plan and Timeline**

The overall plan is to initiate implementation in the Biology program by targeting 3-5 classes that are required or likely to be taken by Biology majors. Once the model is tested in Biology, it can be shared and adapted to other disciplines, and implemented in their programs. It is expected that results and best practices will be ready for reporting and sharing in the spring of 2014. Current funding only allows for this initial stage of implementation with a focus on graduate student participants. Funding support from SOTL would allow us to expand our focus.

- **SPRING 2013**: SEA Scholars recruitment and training; mapping information literacy standards to course and program goals; identifying target course and planning with instructors
- **SUMMER 2013**: Assignment and assessment design; continued communication with instructors
- **FALL 2013**: Implementation of exercises and assessments in target courses in biology, SEA Scholars monitor progress and consult; collection of assessment data
SPRING 2014: Data analysis and interpretation; compilation of results for local dissemination and reporting; revise and improve exercises and assessments; identify new target courses for the fall

SUMMER 2014: SEA Scholars train instructors and graduate students in other STEM-related programs on adoption and implementation of model; additional courses in Biology targeted

FALL 2014: Expanded implementation in Biology program; SEA Scholars monitor and consult on implementation in other STEM-related programs