

**Course Development and Enhancement Grants
2013-2014**

1. Proposal Title: Incorporation of Inquiry-Based Learning in Principles of Biology I
2. Name of the Proposer: Jackie Brittingham and Clint Meyer
3. A description of the proposed course for which funding is being sought if it is a new course, or the catalog description if it is an existing course.

Biol 110 Principles of Biology I

A course that imparts an appreciation of the vast diversity of structure and function in prokaryotes, protists, fungi, animals, and plants, and an understanding of their evolutionary relationships and adaptations to their environments. Three lectures and one three-hour laboratory period. Biology 110 is the prerequisite for 230, 235, 245, 253, 260, 275, 285, 322, 350, 358 and 375. Cornerstone 2A. Four credits w/lab. *Offered every fall.*

4. Information about when and how often you intend to teach the course.
This course is taught every fall.

5. A description of how you intend to use the funding. This should include a specific description of the purchases and activities, including location, schedules or itineraries. Provide a justification for your use of the funds. For example, articulate the need for travel: why must you travel rather than contact someone over the phone or use an electronic database?

The curriculum for Biol 110: Principles of Biology I has remained relatively unchanged for 20 years (with the exception of incorporating new editions of textbooks and associated updates), and consists largely of displays and demonstrations that do little to actively engage student learning. This is a concern because all Biology Majors and Minors take this course; it is the first introduction for almost all of our students to the major and to science in general. The Biology Department has continued a conversation for the past several semesters to update our approach, in particular in the laboratory component of the course. During Fall 2013, Jackie Brittingham will be on sabbatical leave, and Clint Meyer will be teaching Biol 110 lecture for the first time; this represents an ideal time to make significant changes to the course. The funding would be used to completely revamp the current laboratory component. We plan to develop four three-week inquiry-based lab modules that would engage students to help them learn the fundamentals of biology content, while putting in practice skills necessary for completing the scientific method. We hope to transform this course into an experience that prepares our students for continued success in the program and beyond.

Recent professional development experiences have provided resources and increased motivation for us to improve this course experience for our students. At the Simpson Fall 2012 faculty workshop, Dr. Terry Doyle presented research related to the neuroscience of learning and focused on the importance of active engagement to student learning outcomes. Additionally, Jackie Brittingham and Clint Meyer attended a workshop hosted by the AAC&U entitled, "Next Generation STEM Learning: Investigate, Innovate, Inspire." We met faculty from several institutions currently employing inquiry-based activities that can be used as resources for implementation and assessment of these methods. Additionally, we have been in conversation with a Simpson College alum, Jaime Mason Sabel. She has the unique perspective of having completed this course at Simpson. She is currently a PhD candidate in the Science Education program at the University of Iowa and represents a critical resource (CV attached). We plan to draw

upon her experience and expertise as we implement our approach. She will be a particularly important resource as we design tools to collect and assess student learning and progress toward the outlined objectives.

Specifically, Jackie Brittingham and Clint Meyer will spend Summer 2013 investigating best practices in college-level Biology education. We will contact educators from premiere programs, consult science education literature, and draw on Jaime Sabel's expertise as we work to develop a series of inquiry-based laboratory experiences that will help us challenge our students to develop skills in scientific reasoning, critical thinking, and written and oral communication while they actively engage with Biology content. The funding we are requesting would be used for Jaime Sabel's travel to Simpson to have an initial conversation (early Summer 2013) and to help synthesize our final plan of action, immediately prior to Fall 2013.

6. A description of the student learning outcomes that will be met *through the use of these funds* and a description of how these learning outcomes will be assessed. These learning objectives should focus on what students not instructors will do. The best learning objectives start with action verbs that are measurable. Illustrate, critique, and construct are better verbs to use in a learning objective than understand. The following website provides a long list of possible action verbs: <http://www.cme.northwestern.edu/docs/templates/objectives.pdf>

The overarching goal of this proposal is to improve student experience in our introductory Biology course by providing a more engaging learning experience. Planned three-week modules will be designed to introduce students to content through inquiry, by making it part of a short-term research experience.

The following is a list of learning objectives that will be achieved through the proposed work. Students will...

- Demonstrate the ability to follow the scientific method to investigate several real world research questions.
- Generate and interpret biological information.
- Communicate, both in written and oral form, the results of inquiry-based investigations.
- Integrate information from lecture and from the scientific literature as it relates to research projects in lab.
- Synthesize information from early in the semester as it relates to subsequent projects.

These learning objectives will all be assessed by the evaluation of student work generated as part of these inquiry-based experiences. Specifically, written lab reports and oral presentations of results will be used to assess the ability of the students to achieve the aforementioned objectives. Comparisons of these avenues of communication from early to late in the semester will help us assess student improvement in these objectives as the semester progresses. New tools for assessment is part of what we hope to develop and implement during our revamping of this course, with the help of Jaime Sabel. Thus, some aspects of our assessment of the learning objectives will be tools new to the department.

7. Please clarify how your proposal supports the College's mission and strategic plan. Preference will be given to proposals that

- reflect "an innovative teaching and learning process" consistent with Simpson's mission statement, and that
- further one of Simpson's strategic goals

Intellectual and practical skill

Integrative learning

Responsible citizenship in a global context

Leadership

Personal and social responsibility

This plan would help us to directly achieve Simpson's mission in a course that is taken by all majors and minors within Biology and Environmental Science (including Pre-Nursing, Pre-Health Sciences, Neuroscience), and would involve approximately 70-80 students per Fall semester. Specifically, the proposed inclusion of inquiry-based laboratory modules would help us achieve "an innovative teaching and learning process" that is currently lacking in this experience for our students. It would also help us to challenge students to hone intellectual and practical skills, specifically related to the synthesis and application of biological knowledge and use of scientific method (and associated skills in critical thinking, scientific reasoning, and communication). Finally, it would provide integrative learning opportunities for our students to connect lecture material with hands-on inquiry-based lab experiences.

8. A complete budget for the project. The budget should be submitted using the standardized budget form available from the Faculty Development Office. This form includes information about budget restrictions.

Please see attached.

9. Please indicate whether, if your proposal is funded, we may share your proposal with others. Your answer to this question will not influence whether your proposal is funded.

If this proposal is funded, the office of professional development may use any portion of the proposal in any way that would assist the preparation of future proposals for Course Enhancement Grants.

SIMPSON COLLEGE
BUDGET PROPOSAL FORM
Course Development and Enhancement Grant
2013 - 2014

Bittingham + Meyer

ITEM		AMOUNT
Equipment		\$
1:	Cost:	
2:	Cost:	
3:	Cost:	
Materials		\$
1:	Cost:	
2:	Cost:	
3:	Cost:	
Travel Costs		\$
Airfare:		
Mileage: Number of miles <u>520</u> @.565/mile (or current mileage rate)		293.80
<i>260 miles, 2 trips</i>		
Lodging		\$
Number of days <u>2</u> @ \$ <u>75</u> /day		150
<i>2 stage</i>		
Other Expenses		\$
1: <i>Food</i>	Cost: <i>28/day x 2</i>	56
2:	Cost:	
3:	Cost:	
TOTAL EXPENSES		\$
AMOUNT REQUEST (not to exceed \$500)		\$ <i>499.80</i>

JAIME L. SABEL

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EDUCATION

- PhD** The University of Iowa, Iowa City, IA
Science Education, Degree in progress, expected May 2016
- MS** The University of Iowa, Iowa City, IA
Interdisciplinary Studies, Graduate Program in Genetics, May 2008
Interdisciplinary Graduate Program in Genetics
Advisor: Robert Cornell, PhD, Associate Professor of Anatomy and Cell Biology
- BA** Simpson College, Indianola, IA
Biology, May 2000
Minor in English

TEACHING EXPERIENCE

Adjunct Instructor

Kirkwood Community College, Cedar Rapids and Iowa City, IA

January 2011-present

- Instructed courses, including lab sections
 - Fall 2011—Spring 2013 – BIO 104 Introductory Biology with Lab
Course description: Intended as a beginning-level course for liberal arts students who are not planning to major in the sciences. The course includes genetics, evolution, ecology, plant and animal reproduction, and biodiversity. Current topics in life science are covered throughout the course. Students are offered a variety of opportunities in laboratory through investigations, discussion, written expression and readings.
 - Spring 2011 - Two sections of BIO 110 Basic Biological Concepts
Course description: Designed for the student with little or no background in biology or chemistry, or as a refresher for the student who has not taken either for many years. This course provides a basic foundation for further course work in the biological sciences.
- Created and implemented a variety of assignments and activities including lab reports, oral presentations, article reviews, experiments, and case studies.
- Evaluated students with both formative and summative assessments
- Advised students on course progress

Instructor

Belin Blank Center Summer Program, The University of Iowa, Iowa City, IA

June 2012

- Taught a week-long course, The Human Genome, to 7th and 8th grade students in the Junior Scholars Institute (JSI).
- Organized supplies, activities, laboratory tours, and guest speakers.
- Hired and supervised a teaching assistant.
- Provided feedback to parents in the form of course summaries, individualized student comments, and opening and closing ceremony overviews of the course.

Teaching Assistant

The University of Iowa, Iowa City, IA

January 2007-May 2007

Developmental Biology Laboratory Course

Supervised by Douglas Houston, PhD, Assistant Professor of Biology

- Taught lab sessions including introductory lectures and explanations of methods
- Assisted students with laboratory techniques
- Wrote and graded laboratory quizzes and graded laboratory reports
- Assisted students in improving science writing skills
- Assisted in preparation of the teaching laboratory for each new session

GRADUATE RESEARCH APPOINTMENTS

Graduate Research Assistant

The University of Iowa, Iowa City, IA

August 2012-present

Worked with Cory Forbes, PhD, Assistant Professor, Science Education Program

- Conducted research with the RAES-Iowa project examining the use of professional development and reflective assessment strategies in elementary science classrooms.
- Assisted in the development of an online log for teachers to record progress.
- Developed a rubric for scoring the online log.
- Assisted in professional development workshop planning and implementation.

Graduate Research Assistant

The University of Iowa, Iowa City, IA

August 2011-July 2012

Worked with Brian Hand, PhD, Professor, Science Education Program

- Conducted research examining the effects of the Science Writing Heuristic (SWH) approach in elementary and middle school science classrooms.
- Interviewed teachers and analyzed student writing samples.
- Traveled to South Korea with funding from the Stanley Award for International Research to examine the SWH approach in Korean middle school classrooms.

Graduate Research Assistant

The University of Iowa, Iowa City, IA

August 2004-February 2008

Laboratory of Robert Cornell, PhD, Associate Professor of Anatomy and Cell Biology

Thesis project: "Maternally encoded Interferon regulatory factor 6 (Irf6) is required for maintenance of superficial epithelia in *Danio* and *Xenopus* embryos."

- Prepared manuscripts and figures; presented research in seminars and at local and national conferences
- Trained summer and undergraduate students in concepts and methods
- Performed laboratory techniques: *Danio rerio* embryo injection, whole mount *in situ* hybridization, immunohistochemistry, PCR, RT-PCR, mRNA synthesis, subcloning and plasmid transformation, confocal microscopy, transmission electron microscopy, cell culture and transfection

PROFESSIONAL EXPERIENCE

Scientific Writer II

Integrated DNA Technologies, Coralville, IA

March 2009-July 2011

- Worked closely with research and product development departments to write plan, write, and edit grants, application-specific guides, technical bulletins, research papers, and other scientific documents as needed
- Co-managed and produced content for DECODED, a quarterly customer newsletter; managed and produced content for two application-specific guides containing experimental overview, protocols and troubleshooting: qPCR Application Guide and Mutagenesis Application Guide
- Worked with product developers to create text for marketing brochures, website product pages, and press releases
- Wrote SBIR phase II grant and SBIR phase I extension that were both successfully funded by the NIH
- Coordinated science education outreach relationship between IDT and the representative for the NIH-sponsored National Lab Day and the Educate to Innovate initiative; taught training sessions about research applications for new products

Research Assistant II

The University of Iowa, Iowa City, IA

March 2008-February 2009

Laboratory of Vladimir Badovinac, PhD, Assistant Professor of Pathology

Project: CD8 T cell memory formation

- Set up, organized, and managed lab; maintained lab budget
- Trained graduate students in concepts and methods
- Edited manuscripts and grants; created and edited written protocols; presented research at departmental conference
- Performed laboratory techniques: care and handling of *Mus musculus*, cell culture, RNA isolation, flow cytometry, cell sorting, T cell labeling, work with *Listeria monocytogenes*

Research Assistant I

The University of Iowa, Iowa City, IA

July 2000-July 2004

Laboratory of John Dagle, MD, PhD, Associate Professor of Pediatrics

Projects: Antisense oligonucleotide synthesis and *Xenopus laevis* development.

- Managed and organized lab
- Trained fellows and summer students in concepts and methods
- Performed laboratory techniques: northern, Southern, and western analysis, DNA isolation from *Xenopus laevis* embryos and adult tissues, DNA cloning and plasmid preparation, oligonucleotide synthesis and purification, cell death and fluorescence assays, care and handling of *Xenopus laevis* adults and embryos

CERTIFICATES

2011-present Graduate Certificate in College Teaching, in progress

2010 Certificate Course: TechComm 101, Society for Technical Communication

AWARDS AND RECOGNITION

2012 Teaching and Learning Accomplishment Scholarship recipient

2012 NESCent Evolution Scholar award recipient

2012 Stanley Award for International Research grant recipient

Received funding for travel to South Korea to investigate the Science Writing Heuristic (SWH) approach to science education.

2007 The University of Iowa Interdisciplinary Program in Genetics training grant recipient

PUBLICATIONS

Sabel, J. (2011). An Interview with Dr. John Rossi. *European Pharmaceutical Review*, August 1.

Behlke, M., Rose, S., & **Sabel, J.** (2010). Upping the Sensitivity and Accuracy of qPCR. *Genetic Engineering and Biotechnology News*, 30(10), 34–35.

Wirth, T. C., Xue, H-H., Rai, D., **Sabel, J.**, Bair, T., Harty, J. T., & Badovinac, V. P. (2010). Repetitive antigen stimulation induces stepwise transcriptome diversification but preserves a core signature of memory CD8(+) T cell differentiation. *Immunity*, 33(1), 128–140.

Schlub, T. E., Badovinac, V. P., **Sabel, J.**, Harty, J. T., & Davenport, M. P. (2010). Predicting CD62L expression during the CD8+ T-cell response *in vivo*. *Immunology and Cell Biology*, 88(2), 157–164.

Sabel, J. L., Houston, D. W., d'Alencon, C., O'Brien, E. K., Van Otterloo, E., Lutz, K.,... Cornell, R. A. (2009). Maternally encoded Interferon regulatory factor 6 (Irf6) is required for maintenance of superficial epithelia in *Danio* and *Xenopus* embryos. *Developmental Biology*, 325(1), 249–262.

Lennox, K. A., **Sabel, J. L.**, Johnson, M. J., Moreira, B. G., Fletcher, C. A., Rose, S. D.,...Dagle, J. M. (2006). Characterization of modified antisense oligonucleotides in *Xenopus laevis* embryos. *Oligonucleotides*, 16(1), 26–42.

Elizondo, M. R., Arduini, B. L., Paulsen, J., MacDonald, E. L., **Sabel J. L.**, Henion, P. D.,...Parichy, D. M. (2005). Defective skeletogenesis with kidney stone formation in dwarf zebrafish mutant for *trpm7*. *Current Biology*, 15, 667–671.

Dagle, J. M., **Sabel, J. L.**, Littig, J. L., Sutherland, L. B., Kolker, S. J., & Weeks, D. L. (2003). Pitx2c attenuation results in cardiac defects and abnormalities of intestinal orientation in developing *Xenopus laevis*. *Developmental Biology*, 262, 268-281.

Murphy, C. R., **Sabel, J. L.**, Sandler, A. D., & Dagle, J. M. (2002). Survivin mRNA is downregulated during early *Xenopus laevis* embryogenesis. *Developmental Dynamics*, 225, 597–601.

PRESENTATIONS

Sabel, J., Keles, N., Park, S., & Seung, E. (2013). *Exploring Pre-candidate Teachers' Identity Formation*. Stand-Alone Paper accepted to NARST Annual International Conference, Rio Grande, Puerto Rico.

Sabel, J., Suh, J. K., Villanueva, M. G., & Hand, B. (2012). *Developing scientific ideas through writing-to-learn activities: the impact of teacher classroom practice*. Poster presented at The University of Iowa Department of Teaching and Learning Research Symposium, Iowa City, IA.

Keles, N., **Sabel, J.**, & Park, S. (2012). *Investigation of pre-candidate teachers' identity formation while taking the 'Exploring Teaching Math and Science' (ETMS) course*. Poster presented at The University of Iowa Department of Teaching and Learning Research Symposium, Iowa City, IA.

Sabel, J. (2012). *Finding ways to encourage student questions*. Round table discussion conducted at the Iowa Statewide Adjunct Conference, Cedar Rapids, IA.

Sabel, J. & Badovinac, V. (2008). *Memory CD8 T cells after multiple antigenic encounters*. Oral presentation at The University of Iowa Department of Pathology Research Day, Iowa City, IA

- Sabel, J., d'Alencon, C., O'Brien, E., Schutte, B., Houston, D., & Cornell, R. (2008).** *Cleft palate-associated gene, irf6, is required for cell adhesion in superficial epithelia of frog and zebrafish gastrula-stage embryos.* Oral presentation at the Experimental Biology 2008 Meeting, San Diego, CA.
- Sabel, J., d'Alencon, C., O'Brien, E., Schutte, B., Houston, D., & Cornell, R. (2007).** *Inhibition of oral-facial clefting gene Interferon Regulatory Factor 6 disrupts superficial epithelia during zebrafish gastrulation.* Oral presentation at The University of Iowa Genetics Program Retreat, Iowa City, IA.
- Sabel, J., d'Alencon, C., O'Brien, E., Rorick, N., Schutte, B., & Cornell, R. (2007).** *Inhibition of oral-facial clefting gene Interferon Regulatory Factor 6 disrupts superficial epithelia during zebrafish gastrulation.* Poster presented at the Midwest Regional Society for Developmental Biology Meeting, Chicago, IL.
- Sabel, J., d'Alencon, C., O'Brien, E., Rorick, N., Schutte, B., & Cornell, R. (2007).** *Inhibition of oral-facial clefting gene Interferon Regulatory Factor 6 disrupts superficial epithelia during zebrafish gastrulation.* Poster presented at The University of Iowa Carver College of Medicine Research Week, Iowa City, IA.
- Sabel, J., d'Alencon, C., Rorick, N., Hemerson, P., Schutte, B., & Cornell, R. (2006).** *Inhibition of oral-facial clefting gene Interferon Regulatory Factor 6 disrupts gastrulation, pectoral fin formation, and somite boundary formation in zebrafish.* Poster presented at the National Society for Developmental Biology Meeting, Ann Arbor, MI.
- Sabel, J., d'Alencon, C., Rorick, N., Hemerson, P., Schutte, B., & Cornell, R. (2006).** *Inhibition of oral-facial clefting gene Interferon Regulatory Factor 6 disrupts gastrulation, pectoral fin formation, and somite boundary formation in zebrafish.* Poster presented at The University of Iowa 8th Annual Student Interdisciplinary Health Research Poster Session, Iowa City, IA.
- Sabel, J., d'Alencon, C., Rorick, N., Hemerson, P., Schutte, B., & Cornell, R. (2006).** *Inhibition of oral-facial clefting gene Interferon Regulatory Factor 6 disrupts gastrulation, pectoral fin formation, and somite boundary formation in zebrafish.* Poster presented at The University of Iowa Carver College of Medicine Research Week, Iowa City, IA.
- Sabel, J., d'Alencon, C., Malik, M., Hemerson, P., Schutte, B., & Cornell, R. (2005).** *Van der Woude oral-facial clefting syndrome gene, interferon regulatory factor 6, is expressed during zebrafish craniofacial development.* Poster presented at the Midwest regional Society for Developmental Biology Meeting, Chicago, IL.

NATIONAL MEETING TRAVEL AWARDS

NESCent Travel Award for the National Association of Biology Teachers Conference, 2012

Travel Award for American Association of Anatomists Annual Meeting, 2008

Travel Award for National Society for Developmental Biology Meeting, 2006

PROFESSIONAL DEVELOPMENT

2012 Classroom Assessment Techniques (CATs) Teaching Circle, Kirkwood Community College

iFellows: PhD ePortfolio: Showcasing Teaching, Research, & Service

iFellows: Turning Papers into Publications

iFellows: Role of Service in Academe

Grant and Research Services Center (GRSC): Search for Funding

iFellows: The Basics of the IRB Process

iFellows: Academic Interviews and Negotiations

2011 The Network: Putting the Pieces Together: Searching for External Funding

The Network: Writing Productively

iFellows: Graduate Teaching Certificate Program

iFellows: Mentoring seminar

iFellows: CVs, cover letters, and ePortfolios

iFellows: Making the Most of Graduate School

2011-present member of iFellows (Iowa Education Fellows)

2010 Write Winning Grants Seminar, Grant Writing Seminars and Workshops, The University of Iowa

2010 Microsoft Office Excel Training, New Horizons Classroom Learning

ACADEMIC AND PROFESSIONAL SERVICE

2012-present mentor, Critical MASS Program, The University of Iowa

2012-present graduate student member, The University of Iowa Council on the Status of Women

2012-present president, Graduate Students in Science Education (GSSE)

2012 judge, State Science and Technology Fair of Iowa

2009-2011 community member, The University of Iowa Institutional Biosafety Committee

2009-2010 volunteer, Iowa N.E.W. Leadership

2008-present group facilitator, The University of Iowa Women's Resource and Action Center

2006-2009 board member, Iowa City Darwin Day Board of Directors

2005 student representative, The University of Iowa Biosciences Program Admissions Committee

PROFESSIONAL MEMBERSHIPS

2012 American Association of University Women (AAUW)

2012 National Association of Biology Teachers (NABT)

2012 National Association for Research in Science Teaching (NARST)

2012 School Science and Mathematics Association (SSMA)

2011 National Science Teachers Association (NSTA)

2011 Iowa Academy of Science (IAS)

2006 Society for Developmental Biology (SDB)

1998 American Association for the Advancement of Science (AAAS)

PROFESSIONAL MATERIALS

References are available upon request.