Michelle K. Smith, Ph.D.
University of Maine
School of Biology and Ecology
5751 Murray Hall
Orono, ME 04469
207-581-2604
michelle.k.smith@maine.edu

Professional Preparation

University of Washington, Seattle, WA	Zoology	Ph.D., 2006
University of Dayton, Dayton, OH	Biology	M.S., 2000
Hanover College, Hanover, IN	Biology	B.A., 1998

Current Position

Associate Professor, School of Biology and Ecology, and Research in STEM Education Center, University of Maine, 2016-current.

In 2015 I was awarded the C. Ann Merrifield Professorship in Life Science Education for teaching ability and outstanding research in science education. This is a newly established professorship and the first time it has been awarded.

Previous Positions

Assistant Professor, School of Biology and Ecology, and Research in STEM Education Center, University of Maine, 2011-2016.

Lecturer, Department of Genome Sciences, University of Washington, Seattle, 2010-2011.

Science Teaching Fellow and Research Associate, Department of Molecular, Cellular, and Developmental Biology and Science Education Initiative, University of Colorado, Boulder, 2007-2010.

Publications

Pelletreau KN, Andrews T, Armstrong N, Bedell MA, Dastoor F, Dean N, Erster S, Fata-Hartley C, Guild M, Greig H, Hall D, Knight JK, Koslowsky D, Lemons PP, Martin J, McCourt J, Merrill J, Moscarella R, Nehm R, Northington R, Olsen B, Prevost L, Stoltzfus J, Urban-Lurain, **Smith MK**. A clicker-based case study that untangles student thinking about the processes in the central dogma. **CourseSource**, 2016. http://www.coursesource.org/courses/a-clicker-based-case-study-that-untangles-student-thinking-about-the-processes-in-the

Prevost LB, **Smith MK,** Knight JK. Using student writing and lexical analysis to reveal student thinking about the role of stop codons in the central dogma. **CBE-Life Sciences Education.** 2016, 15:ar65.

Smith MK, Wood WB. Teaching Genetics: Past, Present, and Future. **Genetics.** 2016, 204:5-10.

Lewin J, Vinson EL, Stetzer MR, **Smith MK**. A campus-wide investigation of clicker implementation: The status of peer discussion in STEM classes. **CBE-Life Sciences Education.** 2016, 15:1-12.

Barth-Cohen L, **Smith MK,** Capps D, Shemwell J, Lewin J, Stetzer MR**.** What are middle school students talking about during clicker questions? Characterizing small-group conversations mediated by classroom response systems. **Journal of Science Education and Technology**, 2016*,* 25:50-61.

Batz Z, Olsen BJ, Dumont J, Dastoor J, **Smith MK.** Helping struggling students in introductory biology: A peer tutoring approach that improves performance, perception, and retention. **CBE-Life Sciences Education.** 2015, 14:1-12. *This article was featured as an issue highlight and is one of the most read articles in this journal.*

Smith MK, Merrill S. Why do some people inherit a predisposition to cancer? A small group activity on cancer genetics. ***CourseSource****.* 2015, http://coursesource.org/courses/why-do-some-people-inherit-a-predisposition-to-cancer-a-small-group-activity-on-cancer.

Smith MK, Vinson EL, Smith JA, Lewin JD, Stetzer M. A campus-wide study of STEM courses: New perspectives on teaching practices and perceptions. **CBE-Life Sciences Education***.* 2014*, 13:624-635.*

Freeman S, Eddy SL, McDonough M, **Smith MK**, Okoroafor N, Jordt H, Wenderoth MP. Active learning increases student performance in science, engineering, and mathematics. **PNAS**. 2014, 11(23):8410-8415. *This article was named Best of 2014 by Science Insider.*

Smith MK, Jones FHM, Gilbert SL, Wieman C. The Classroom Observation Protocol for Undergraduate STEM (COPUS): a new instrument to characterize university STEM classroom practices. **CBE-Life Sciences Education**. 2013, Winter, 12(4):618-627. *This paper was selected as an Editor's Choice in Science. It was also featured in the Highlights of 2014 print edition and is one of the most read and cited articles in this journal.*

Knight JK, Wood WB, **Smith MK.** What's downstream? A set of classroom exercises to help students understand recessive epistasis. **Journal of Microbiology and Biology Education**. 2013, 14(2) http://jmbe.asm.org/index.php/jmbe/article/view/560.

Smith MK, Wenderoth MP, Tyler M. The teaching demonstration: what faculty expect and how to prepare for this aspect of the job interview. **CBE-Life Sciences Education.** 2013, Spring 12(1):12-18. *This paper was featured in the Highlights of 2013 print edition.*

Smith MK, Annis SL, Kaplan JJ, Drummond F. Using peer discussion facilitated by clicker questions in an informal education setting: enhancing farmer learning of science. **PLOS-ONE.** 2012, 7(10/journal.pone.0047564.

Smith MK, Thomas K, Dunham M. In-class incentives that encourage students to take concepts assessments seriously. **Journal of College Science Teaching.** 2012, 42(2): 57-61.

Smith MK and Knight JK. Using the genetics concept assessment to document persistent conceptual difficulties in undergraduate genetics courses. **Genetics.** 2012, 181(1):21-32*. This paper was featured in the "Issue Highlights" section of the journal.*

Smith MK. A fishy way to discuss multiple genes affecting the same trait. **PLOS-Biology.** 2012, 10(3): e1001279. doi:10.1371/journal.pbio.1001279 This paper was cited as an example of an effective instructional activity in a *US Congressional* report entitled: *Applying New Research to Improve Science Education.*

Semsar K, Knight JK, Birol G, **Smith MK**. The Colorado Learning Attitudes about Science Survey (CLASS) for use in biology. **CBE-Life Sciences Education**. 2011, Fall 10(3):268-278. *This paper was cited in the Discipline Based Education Research Report from the National Academies (2012). It is also ranked as one of the top cited articles in this journal.*

Haudek KC, Kaplan JJ, Knight J, Long T, Merrill J, Munn A, Nehm N, **Smith M,** Urban-Lurain M. Harnessing technology to improve formative assessment of student conceptions in STEM: Forging a national network. **CBE-Life Sciences Education.** 2011*,* Summer; 10(2):149-155.

Smith MK, Wood WB, Krauter K, Knight JK. Combining peer discussion with instructor explanation increases student learning from in-class concept questions. **CBE-Life Sciences Education**. 2011, Spring; 10(1):55-63*. This paper was featured in the Highlights of 2011 print edition, cited in the Discipline Based Education Research Report from the National Academies (2012), and ranked as one of the top read and cited articles in this journal.*

Smith MK, Trujillo C, Su TT. The benefits of using clickers in small enrollment seminar-style biology courses. **CBE-Life Sciences Education**. 2011, Spring; 10(1):14-17.

Smith MK and Perkins KK. "At the end of my course, students should be able to …": The benefits of creating and using effective learning goals. **Microbiology Australia**. 2010, 31(1):35-37.

Knight JK and **Smith MK**. Different but equal? How non-majors and majors approach and learn genetics. **CBE-Life Sciences Education**. 2010, Spring; 9(1):34-44.

Smith MK, Wood WB, Adams WK, Wieman C, Knight JK, Guild N, Su TT. Why peer discussion improves student performance on in-class concept questions. **Science**. 2009, 323(5910):122-124.

Smith MK, Wood WB, Knight JK. The Genetics Concept Assessment: a new concept inventory for gauging student understanding of genetics. **CBE-Life Sciences Education**. 2008 Winter; 7(4):422-430. *This article was featured in the Highlights of 2008 print edition. It is currently the second most cited article in this journal.*

Smith M, Wakimoto B. Complex regulation and multiple developmental functions of *misfire,* the *Drosophila melanogaster* ferlin gene. **BMC Developmental Biology**. 2007, 7:21-36.

Peer Reviewed Website

Smith MK, Meneely P, Waterston R. Contributor to the modENCODE education website. "*C. elegans* as a Model Organism," "Apoptosis - What do Worm Cells, the Space Between my Fingers, and Cancer have in Common?" "Aging - That Worm Looks Fantastic for its Age!" "Genes - Pick a Gene, Make a Mutant!" **Science.**
http://modencode.sciencemag.org/worm/introduction
http://modencode.sciencemag.org/worm/apoptosis
http://modencode.sciencemag.org/worm/aging
http://modencode.sciencemag.org/worm/genes

Instructor Resource Guide

Wieman C, Perkins, K, Gilbert S, Arthurs L, Bair A, Stempien J, Benay F, Kennedy S, Semsar K, Knight J, Shi J, **Smith M**, Kelly T, Taylor J, Yurk H, Birol G, Langdon L, Pentecost T, Stewart J, Gilley B, Jones F, Kennedy B, Chasteen S, Simon B. Clicker Resource Guide: An Instructor's Guide to Effective use of Personal Response Systems (Clickers) in Teaching. 2008, Science Education Initiative, University of British Columbia and University of Colorado at Boulder.

Book Chapter

Dorman J, **Smith M**, O'Brien S, Freisem K. Teaching in Lab Settings. In C. Ross and J. Dunphy (Eds.), Strategies for Teaching Assistant and International Teaching Assistant Development: Beyond Micro Teaching, 2007. Anker Publishing.

Conference Papers

Urban-Lurain M, Cooper MM, Haudek KC, Kaplan JJ, Knight JK, Lemons PP, Lira CT, Merrill JE, Nehm R, Prevost LB, **Smith MK**, Sydlik M. Expanding a national network for automated analysis of constructed response assessments to reveal student thinking in STEM. 2014. Paper presented at the American Society for Engineering Education. Indianapolis, IN. *Note: Co-authors are listed in alphabetical order and contributed equally.*

Prevost LB, Knight JK, **Smith MK**, Urban-Lurain M. Student writing reveals their heterogeneous thinking about the origin of genetic variation in populations. 2013. In Proceedings of the National Association for Research in Science Teaching (NARST) annual conference. Rio Grande, Puerto Rico.

Awarded Grants and Fellowships

External Grants Awarded:

11 grants, 8.8 million with 3.1 million to the University of Maine

NSF Noyce Grant, **Co-PI**, A Model NSF Teaching Fellowship Program to Improve STEM Teacher Recruitment, Preparation, Professional Development, and Retention in Rural High-Need Schools, $1,950,034

Promoting Active Learning and Mentoring (PALM) fellowship through the NSF and the Genetics Society of America, **Mentor,** Fellowship to provide long-term mentoring to postdocs who would like to gain experience in active-learning instruction, $2000

Davis Educational Foundation, Campus Compact Grant, **Co-PI**, A Multi-course Investigation of Local Water Quality Issues, 2015, $4,000

NSF WIDER, **PI**, Collaborative Research: A Community of Enhanced Assessment Facilitates Reformed Teaching, DUE 1347578, 2013, $54,486 of a $718,000 collaborative project

NSF WIDER, **PI**, Catalyzing Institutional Change Through Synergistic Observation and Professional Development Programs, DUE 1347577, 2013, $249,851

NSF TUES II Grant, **PI**, Collaborative Research: Navigating from Vision to Change with Bio-MAPS, DUE 1322556, 2013, $219,966 of a $528,459 collaborative project

NSF TUES III Grant, **PI**, Collaborative Research: Expanding a National Network for Automated Analysis of Constructed Response Assessments to Reveal Student Thinking in STEM, DUE 1322851 $187,968 of a $5 million collaborative project

NSF Noyce Fellowship, **Co-PI**, Building Rural STEM Educator Capacity through Partnership: Preparation for the Next Generation Science Standards and the Common Core State Standards in Mathematics, DUE 1340033, 2013, $299,998

NSF TUES Central Research Project Grant, **PI**, Development of the Biology Concept Assessment Series, DUE 1245104, 2012, $4,243

Webber Oil Foundation, **PI**, Support for Integrating Clicker Technology in the Middle School Classroom, 2011, $1,500

NSF CCLI Grant, **Co-PI**, Collaborative Research: Automated Analysis of Constructed Response Concept Inventories to Reveal Student Thinking: Forging a National Network for Innovative Assessment Methods, DUE 1022673, 2010, $84,529

University of Maine Internal Grants Awarded:

4 grants total, $91,652

University of Maine RRF Grant, Workforce Development: Helping UMaine Faculty Develop Classroom Activities that Prepare Students for Skills Needed in Maine's Science Careers, 2016, $67,704.40

University of Maine Pre-tenure Fellowship, Modeling Student Problem-Solving Processes and Building Tools for Assessment: Key to Improving Science Education in Large-Enrollment Biology Courses, 2013, $23,124

University of Maine Faculty Incentive Grant, Proposal for the Modification of BIO100 and BIO350, 2012, summer salary support plus money to hire undergraduate Maine Learning Assistants

University of Maine Center for Excellence in Teaching and Assessment, Making Things Click in UMaine Biology Classes, 2011, $824

Invited Seminars and Workshops

Bates College, Lewiston, ME, March 2017
Rice University, Houston, ME, March 2017
Western Sydney University, Sydney, Australia December 2016
Australian Physiological Society, Adelaide, Australia, December 2016
University of Michigan, Ann Arbor, MI November, 2016
Cornell University, Ithaca, NY, October 2016
Genetics Society of America TAGC Meeting, Orlando, FL, July 2016
American Society for Microbiology Microbe Meeting, Boston, MA, June 2016
Jackson Laboratory, Bar Harbor, ME, May 2016
University of West Virginia, Morgantown, WV, December 2015
NSF Advanced Technology Education Meeting, Washington, DC, October 2015
Harvard Medical School, Boston, MA, October 2015
University of Colorado-Boulder Discipline-Based Education Research Group, Boulder, CA, September 2015
Gordon Research Conference on Biology Education Research, Lewiston, ME, July 2015
Stanford University, Palo Alto, CA, April 2015
National Science Foundation, Washington, D.C., March 2015
Dartmouth College, Hanover, NH, March 2015
University of Adelaide Festival of Teaching and Learning, Adelaide, Australia, November 2014
EDUCAUSE, Online National Webinar, August 2014
Gordon Research Conference on Signaling by Adhesion Receptors, Lewiston, ME June 2014
American Physiological Society, Institute for Teaching and Learning, Bar Harbor, ME June 2014
Introductory Physics for the Life Sciences Conference, Washington, D.C., March 2014
York University, Toronto, Canada, March 2014
Salisbury University, Salisbury, MD, March 2014
Yale University, New Haven, CT, December 2013
University of Georgia, Athens, GA, November 2013
Emory University, Atlanta, GA, November 2013
University of Maine Department of Molecular and Biomedical Sciences, Orono, ME, November 2013
HHMI Summer Institute, Boulder, CO, July 2013
MIT, Boston, MA, May 2013
Genetics Education for the 21st Century International Workshop, Utrecht University, Utrecht, Netherlands, March 2013
Simon Fraser University, Burnaby, Canada, March 2013
University of British Columbia, Vancouver, Canada, March 2013
Introductory Biology Project, Washington, D.C., July 2012
Strategies for Success, Toronto, Canada, May 2012
Maine Biological and Biosciences Symposium, Mount Desert Island, ME, April 2012
Society for the Advancement of Biology Education Research, Minneapolis, MN, July 2011
University of Washington, Bothell, WA, April 2011
Experimental Biology, Washington, D.C., April 2011
Northwest Regional Society for Developmental Biology Conference, Friday Harbor, WA, March 2011
Aarhus University, Denmark, March 2010
Hong Kong University, Hong Kong, June 2008
University of British Columbia, Vancouver, Canada, November 2007

Service and Synergistic Activities

Search committee for the School of Biology and Ecology lecturer position, 2017-Present
Member of the Master of Science in Teaching Curriculum Committee, 2016-Present
Designed a booth about genetics for the Maine Science Festival, 2017
K-12 working group for the NIH Genome Research Institute Genomic Literacy, Education, and Engagement (GLEE) Initiative, 2016-Present
School of Biology and Ecology Peer Committee, 2016-Present

Search committee chair for the School of Biology and Ecology Plant Geneticist faculty position, 2016.
University of Maine Chancellor designee to the Maine STEM Council, 2015-Present.
Education Chair for the Genetics Society of America, 2015-Present.
Genetics Society of America representative for CBE-Life Sciences Education, 2015-Present.
Organizer and member of the School of Biology and Ecology Assessment Committee, 2015-Present.
UMaine College of Natural Sciences Forestry and Agriculture representative on the Provost's Advisory Group on Retention and Student Success, 2014-2016.
Co-director of the STEM Faculty Collaborative (SFC) program. For this program faculty members from different STEM departments observe each other teach, fill out observation protocols, and give feedback to each other in order to improve their teaching, 2014-Present.
Co-director of the Head Instructional Assistant (HIA) program. In this program undergraduates who have already been Maine Learning Assistants (MLAs) work with faculty members to design active-learning instructional materials. 2014-Present.
US correspondent for an independent radio show in Melbourne, Australia. The show is called "Einstein A Go-Go" (http://www.rrr.org.au/program/einstein-a-go-go/) and it is broadcast on RRR 102.7 FM. I comment on science education issues from an international perspective, 2014-Present.
Genetics Society of America Editor for CourseSource, 2014-Present.
Monitoring Editor for CBE-Life Sciences Education, 2012-Present.
Steering committee member of the Society for the Advancement of Biology Education Research (SABER), 2012-Present.
Mentor for the Maine Learning Assistant Program (MLA Program). MLAs are STEM undergraduate students who have an interest in education careers. 2011-Present.
Co-director of the University Course Observation Program. This professional development program brings Maine K-12 teachers to the University of Maine to observe STEM courses and provides the teachers the opportunity to conduct observations and reflect on their own teaching, 2011-Present.
Curriculum committee member for the School of Biology and Ecology, 2011-Present.
Participant in the National Science Foundation (NSF)/HHMI STEM Central Meeting, Washington D.C., 2015.
Developed and led four campus-wide faculty professional development sessions for STEM faculty, 2014-2015.
Organizer of and instructor for the Jackson Laboratory Postdoc course in Bar Harbor, ME. This week-long course helps postdocs learn about setting up their first laboratory, grant writing, and teaching using active-learning techniques. 2013-2015.
Executive committee member of the Maine Physical Sciences Partnership project, University of Maine. I report on the research and implementation activities for the university projects and organize monthly meetings of faculty and staff members who are involved in University of Maine course reform, 2012-2015.
Served on an NSF grant review panel in July 2012 and April 2014.
Search committee member for the School of Biology and Ecology Neurophysiology faculty position, 2013-2014.
Participant in the NSF/HHMI/USDA/NIH Vision and Change national meeting, Washington D.C, 2013.
Member of the Genome Sciences Curriculum and Teaching Committee, University of Washington, 2011.
Founding member of the Society for the Advancement of Biology Education Research (SABER), Minneapolis, MN, 2010.
Participant in the National Science Foundation (NSF) National Meeting on STEM Concept Inventories, Washington D.C., 2010.
Member of the MCDB Undergraduate Curriculum Committee, University of Colorado, Boulder, 2008-2010.
Research mentor to a TRIO Advanced underrepresented minority student, University of Colorado, Boulder, 2008.

Participant in the National Science Foundation (NSF) Bio-ED Conversation, University of Illinois, 2008.
Participant in the National Academies Summer Institute for Undergraduate Education in Biology, University of Wisconsin Madison, 2007.
Manuscript reviewer for CBE-Life Sciences Education, BioScience, Journal of Microbiology and Biology Education, American Physiological Society Archive, and Journal of Professional Issues in Engineering Education and Practice.

Press

Description	Website
Article about a collaborative activity 25 faculty members developed	https://umaine.edu/news/blog/2017/01/23/facultys-active-learning-lesson-improves-student-understanding-biology-concept/
Article about the PALM network fellowship	https://umaine.edu/news/blog/2016/03/02/smith-to-mentor-jax-postdoc-about-active-learning-techniques/
Article about teaching in an student-centered manner	https://umainetoday.umaine.edu/archives/springsummer-2015/click/
Article named Best of 2014 by Science Insider; Article #3	http://news.sciencemag.org/scientific-community/2014/12/most-popular-scienceinsiders-2014
Selected press associated with the Freeman *et al.,* 2014 article	**Science** http://news.sciencemag.org/education/2014/05/lectures-arent-just-boring-theyre-ineffective-too-study-finds **PBS** http://www.pbs.org/newshour/rundown/university-lectures-ineffective-learning-analysis-finds/ **Reddit** http://www.reddit.com/r/science/comments/25g077/lectures_arent_just_boring_theyre_ineffective_too/ **Nature commentary on science teaching** http://www.nature.com/news/why-we-are-teaching-science-wrong-and-how-to-make-it-right-1.17963
Article in the Bangor Daily	http://bangordailynews.com/2015/02/03/news/bangor/university-of-maine-professors-research-is-popular-topic-for-scienceinsider/
NSF Discoveries article about research projects	http://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=133670&org=NSF
Highlights from the Festival of Teaching and Learning	http://www.adelaide.edu.au/festival-lt/
iBiology Video on clicker research	http://www.ibiology.org/scientific-teaching/active-learning/evidence/smith-study.html
Guest on RRR FM science radio show “Einstein A Go-Go”	http://rrrfm.libsyn.com/einstein-a-go-go-16-november-2014
Article about NSF grant funding	http://umaine.edu/news/blog/2013/10/18/smith-leads-a-science-transformation/
Article about incorporating real life experiences into my genetics course	http://sbe.umaine.edu/2013/03/a-real-life-look-into-genetics-former-miss-teen-maine-speaks-to-bio-350-about-marfan-syndrome/
Introductory Biology blog about designing effective clicker questions	http://nonmajorsbiology.wordpress.com/2012/07/02/clicker-questions-that-make-students-think/
Selected press about transforming the education experience for blueberry farmers	**UMaine News** http://umaine.edu/news/blog/2012/10/22/improving-educational-outreach/ **School of Biology and Ecology News** http://sbe.umaine.edu/2012/10/sbe-professors-bring-clickers-to-

	blueberry-growers/ **Twitter** Eric Mazur (leading clicker researcher) discussed the article on Twitter.
Article about the use of concept inventories in genetics education	http://www.genetics.org/content/198/1/NP.full
Selected press from the Smith *et al.,* 2009 Science article about peer discussion	https://www.insidehighered.com/news/2009/01/05/peer http://www.colorado.edu/news/releases/2009/01/01/cu-boulder-researchers-show-why-peer-discussion-improves-student