

Anna C. MacPherson

American Museum of Natural History

New York, NY, 10024

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Education

Stanford University, Stanford, CA

Ph.D., Science Education, 2015

Minor, Learning, Cognition, and Assessment

Dissertation title: Developing an assessment of argumentation in the field of ecology

Committee: Dr. Jonathan Osborne, Dr. Sam Wineburg, Dr. Mark Wilson

CUNY Hunter College, New York, NY

M.A., Adolescent Science Education, 2006

Stanford University, Stanford, CA

B.S. with Honors, Biological Sciences, 2003

Minor, Music, 2003

Honors thesis: Glucocorticoids may play dual role in regulation of CNS inflammation

Adviser: Robert Sapolsky

Grants & Awards

- National Association of Research in Science Teaching, Outstanding Doctoral Research Award, 2016
Dissertation judged to have the greatest significance in the field of science education from among the nominees
- REASON International Spring School Travel Fellowship, 2015
Award to travel to Munich Germany, \$700
- Stanford Dissertation Support Grant, 2014
Building an assessment of students' argumentation about ecology, \$5,000
- Anne T. and Robert M. Bass Fellowship, 2010
Three years of graduate tuition and stipend, \$200,000
- Fund for Teachers Grant, 2006
Exploring successful wildlife reserves in South Africa, \$5,000
- Teaching Opportunity Program (TOP) Scholarship, 2004
Hunter College, City University of New York, \$9,500
- Undergraduate Research Opportunities Small Grant, 2003
Can FK506, an anti-inflammatory drug, trigger pro-inflammatory pathways in the brain? \$500
- Research Grant, Howard Hughes Medical Institute, 2002
Glucocorticoids may play dual role in regulation of CNS inflammation, \$3,000

Research Experience

American Museum of Natural History

Senior Manager of Educational Research and Evaluation June 2017 - present

Manager of Educational Research and Evaluation 2015 - 2017

- Leading research on three funded projects. Designing and conducting qualitative and quantitative research about the effect of a large-scale professional development program for middle school science teachers in the New York City Department of Education. Designing validating and analyzing the results from assessments of science learning embedded in a new, NGSS-aligned ecology curriculum. Quantitative researcher on NSF-funded study of BIPOC students' trajectories in science. Leading ongoing evaluation efforts across the museum. Articulating a long-term educational research agenda for the museum.

Stanford University, Stanford, CA

Graduate researcher

2010 - 2015

- Developed items for measuring argumentation ability in middle school students for the Learning Progressions in Middle School Science project. Conducted cognitive labs with students. Analyzed student data using item response theory. Designed and conducted professional learning for middle school science teachers (PIs: Dr. Jonathan Osborne and Dr. Mark Wilson).

Stanford University, Stanford, CA

Research Assistant, Stanford EdCareers

2013-2014

- Developed, administered, and analyzed data from a comprehensive survey of Stanford Graduate School of Education alumni.

University of California, Santa Barbara, Santa Barbara, CA

Laboratory Manager

2008-2010

- Developed lab protocols for accurate and precise measurement of seawater chemistry. Performed molecular processing and coordinated intertidal field projects.

Princeton University, Princeton NJ

Field Assistant

Summer 2004

- Collected data for terrestrial ecosystem ecology project in rainforests near the Franz Josef Glacier, New Zealand.

Stanford University Department of Biological Sciences, Stanford, CA

Undergraduate researcher

2001 - 2003

- Studied the effects of glucocorticoids on brain inflammation following seizure.

**Teaching
Experience**

American Museum of Natural History, Richard Guilder Graduate School

Education Faculty

2016 - present

Teach graduate students pursuing a Master's and teaching credential in secondary science

- Curriculum and Instruction in Earth science 2016 – present

Stanford University

Teaching Assistant

2012 - 2013

Taught graduate students pursuing a Master's and teaching credential in secondary science

- Curriculum and Instruction in Science I
- Curriculum and Instruction in Science II
- Curriculum and Instruction in Science III

Stanford University

Clinical Supervisor, Secondary Science

2011 - 2013

Supervised preservice teachers in their clinical teaching placement in area high schools.

Millennium High School, New York, NY

Teacher

2003 - 2008

Taught grades 9-12 biology, chemistry, scientific research, anatomy and physiology, and advisory

Leadership positions:

- Science department facilitator
- Cooperating teacher, Columbia Teachers College
- New Teacher coach

**Other
Professional
Experience**

Columbia University

Faculty affiliate, Department of Ecology, Evolution and Environmental Biology
Committee member for Masters students pursuing research in education in ecology and learning in informal science institutions. Advisor for educational partnership programs within department.
(2022 – present)

University of California, Berkeley

Consultant on Learning Progressions in Middle School Science (PIs: Dr. Mark Wilson and Dr. Kristin Gunckel) (2015 – present)

Bank Street College of Education, New York, NY

Professional learning specialist (2014 – 2015)

Empirical Education

Educational Consultant (Summer 2012)

EduChange, Inc.

Educational Consultant (2009 – 2011)

Ocean Acidification Training and Research Consortium

Curriculum Developer (2009 – 2010)

**Peer-reviewed
Journal Articles**

- Dozier, S, **MacPherson, A**, Morell, L, Gochyyev, P, Wilson, M (in press). A Learning progression for understanding interdependent relationship in ecosystems. *CBE Life Sciences*.
- Hammerness, K., **MacPherson, A.**, Gupta, P., Jackson, T., & Chafee, R. 2021. Partnerships to offer advanced learning for all students. *Phi Delta Kappan*, 103(4): 49-53.
- Wallace, J, **MacPherson, A**, Hammerness, K., Chavez-Reilly, M., & Gupta, P. 2021. Pivoting in a Pandemic: Supporting STEM Teachers' Learning through Online Professional Learning during the Museum Closure. *Journal of STEM Outreach*.
- Tseng, A, Bonilla, S, & **MacPherson, A.** 2021. Fighting “Bad Science” in the Information Age: The Effects of an Intervention to Stimulate Evaluation and Critique of False Scientific Claims. *Journal of Research in Science Teaching*.
<https://doi.org/10.1002/tea.21696>
- **MacPherson, A**, Gupta, P, & Hammerness, K. 2019. Developing a set of guidelines for rigorous evaluations at a natural history museum. *Journal of Museum Education*, 44(3): 13-19.
- Menge, DNL, **MacPherson, A**, Bytnerowicz, TA, Quebbeman, AW, Schwartz, NB, Taylor, BN, & Wolf, AA. 2018. Logarithms are useful but misleading for data presentation. *Nature Ecology and Evolution* 9; 1393-1399.
- Hammerness, K, **MacPherson, A**, MacDonald, M, Roditi, H, & Curtis-Bey, L. 2017. What does it take to sustain a productive partnership in education? *Phi Delta Kappan*, 99(1): 15-20.
- Hammerness, K, **MacPherson, A**, & Gupta, P. 2016. Developing a research agenda aimed at understanding the teaching and learning of science at a natural history museum. *Curator*, 59: 353-367. doi:10.1111/cura.12178
- **MacPherson, A.** 2016. A comparison of scientists' arguments and school argumentation tasks. *Science Education*. doi:10.1002/scs.21246
- Osborne, J, Henderson, JB, **MacPherson, A**, Wild, A, Szu, E, & Yao, S-Y. 2016. The development and validation of a learning progression for argumentation in science. *Journal of Research in Science Teaching*, 53: 821-846. doi:10.1002/tea.21316
- Henderson, JB, **MacPherson, A**, Osborne, J, & Wild, A. 2015. Beyond construction: Five arguments for the role and value of critique in learning science. *International Journal of Science Education*, 37(10): 1668-1697.

- Henderson, JB, Osborne, J, **MacPherson, A**, & Szu, E. 2014. A New Learning Progression for Student Argumentation in Scientific Contexts. In C. P. Constantinou, N. Papadouris & A. Hadjigeorgiou (Eds.), E-Book Proceedings of the ESERA 2013 Conference: Science Education Research for Evidence-based Teaching and Coherence in Learning. European Science Education Research Association. ISBN: 978-9963-700-77-6.
- Fangué, NA, O'Donnell, MJ, Sewell, MA, Matson, PG, **MacPherson, AC**, & Hofmann, GE. 2010. A laboratory-based, experimental system for the study of ocean acidification effects on marine invertebrate larvae. *Limnology and Oceanography: Methods*, 8: 441-452.
- **MacPherson, AC**, KM Dinkel, & Sapolsky, RM. 2005. Glucocorticoids worsen excitotoxin-induced expression of pro-inflammatory cytokines in hippocampal cultures. *Experimental Neurology*, 194: 376-383.
- Dinkel, KM, **MacPherson, AC**, & Sapolsky, RM. 2003. Novel glucocorticoid effects on acute inflammation in the CNS. *Journal of Neurochemistry*, 84: 705-716.

Books

- Osborne, J, Donovan, B, Henderson, JB, **MacPherson, A**, & Wild, A. 2016. *Arguing from Evidence in Middle School Science: 24 Activities for Productive Talk and Deeper Learning*, Corwin, Thousand Oaks, CA.

Book chapters

- **MacPherson, A**, Howes, E, Abowd, N., Gupta, P, Hammerness, K & Kinzler, R. 2020. Preparing teachers in a nonuniversity site. In Stroupe, D, Hammerness, K., & McDonald, S. (Eds) *Preparing Science Teachers Through Practice-Based Teacher Education*, Harvard Education Press.
- Osborne, J, **MacPherson, A**, Patterson, A & Szu, E. 2012. Introduction. In MS Khine, *Perspectives on Scientific Argumentation*, Springer.

Opinion

- Hammerness, K & MacPherson, A et al. 2022. Missed Opportunities in Online Learning. Inside Higher Education. <https://www.insidehighered.com/views/2022/03/14/stem-students-struggled-online-learning-opinion>

Peer-reviewed Conference Papers and Presentations

- Gunckel, K., Moreno, D., Tan, S., **MacPherson, A.**, Dozier, S., & Morell, L. Examining the crosscutting concept of patterns: An initial construct map in the context of ecosystems. A poster to be presented at the Annual Meeting of the National Association for Research in Science Teaching, April 2022.
- Hammerness, K., **MacPherson, A.** et al. Informal Science Institutions and Equity: Taking this Moment to Act with Justice. A poster session to be presented at the Annual Meeting of the American Educational Research Association, April 2022.
- Wilson, M., Suksiri, W., Morell, L., Osborne, J., **MacPherson, A.**, & Dozier, S. Investigating measurement invariance of a complex academic practice across different subject areas. A paper to be presented at the Annual Meeting of the National Council on Measurement in Education, April 2022.
- Wilson, M., Suksiri, W., Morell, L., Osborne, J., **MacPherson, A.**, & Dozier, S. Relationship between measures of “21st century skills” and the content underlying them. A paper to be presented at the Annual Meeting of the National Council on Measurement in Education, April 2022.
- **MacPherson, A**, Howes, E, Hammerness, K, Abowd, N, Gupta, P, & Kinzler, R. Working on the Practice of Eliciting and Working with Students' Ideas in a Museum Setting. A poster presented at the Annual Meeting of the American Educational Research Association (Virtual), April 12, 2021.
- Dozier, S, **MacPherson, A**, Morell, L, Suksiri, W, Wilson, M, & Osborne, J. Uncovering Students' Developing Understanding of Interdependent Relationships in Ecosystems. A

paper presented at the Annual Meeting of the National Association for Research in Science Teaching (Virtual), April, 2021.

- Chaffee, R, Gupta, P, Hammerness, K, Podkul, T, **MacPherson, A**, Chavez-Reilly, M, Anderson, K., Princiotta, D, Saucedo, D. Supports and Challenges during Educational Crisis: Examining the Impact of the Pandemic on Youth Pathways. A paper presented at the Annual Meeting of the National Association for Research in Science Teaching (Virtual), April 2021.
- Lyu, X and **MacPherson, A**. Students' use of Science Concepts in Generating Scientific Explanations. Accepted to the Annual Meeting of the American Educational Research Association (April, 2020, cancelled).
- Lyu, X and **MacPherson, A**. Incorporate Science Concepts in the Process of Generating Scientific Explanations. Accepted to the Annual Meeting of the National Association for Research in Science Teaching (March, 2020, cancelled)
- **MacPherson, A**, & Hammerness, K. Exploring Ambitious Science Teaching in a Museum. Poster presented at the 2019 Annual Meeting of the National Association of Research in Science Teaching (NARST), Baltimore, MD.
- **MacPherson, A**, Chavez-Reilly, M, & Hammerness, K. Explaining the Advantage in Urban Advantage. Poster presented at the 2019 Annual Meeting of the American Educational Research Association (AERA), Toronto, Canada.
- Hammerness, K, **MacPherson, A**, Chavez-Reilly, M, Roditi, H, Weinstein, M, & Curtis-Bey, L. Supporting and sustaining productive Research-Practice Partnerships in STEM: The development of a 13-year RPP involving school district, cultural institutions, and university participants. Presentation at the 2018 Annual Meeting of the American Educational Research Association (AERA), New York, NY.
- **MacPherson, A**, Chavez-Reilly, M, Hammerness, K. Professional learning in Urban Advantage and the development of core science teaching practices. Presentation at the 2018 Annual Meeting of the National Association of Research in Science Teaching (NARST), Atlanta, GA.
- **MacPherson, A**. Disruptions in Ecosystems: NGSS-designed curriculum unit and assessments for middle school students. Presentation at the 2017 Annual Meeting of the Ecological Society of America (ESA), Portland, OR.
- Menge, DNL, **MacPherson, A**, Bytnerowicz, TA, Quebbeman, AW, Schwartz, NB, Taylor, BN, & Wolf, AA. Logarithms are useful but misleading for data presentation. Presentation at the 2017 Annual Meeting of the Ecological Society of America (ESA), Portland, OR.
- **MacPherson, A**. Developing assessments for an NGSS-designed middle school ecosystems unit. Paper presented at the 2017 Annual Meeting of the National Association of Research in Science Teaching (NARST), San Antonio, TX.
- **MacPherson, A**. Measuring students' understanding of science and engineering practices, disciplinary core ideas, and crosscutting concepts through an embedded assessment system. Paper presented at the 2016 Annual Meeting of the National Association of Research in Science Teaching (NARST), Baltimore, MD.
- **MacPherson, A**. Measuring High School Students' Ability to Construct and Critique Arguments in Ecology. Paper presented at the 2015 Annual Meeting of the National Association of Research in Science Teaching (NARST), Chicago, IL.
- **MacPherson, A**. Developing an assessment of argumentation in ecology. Presentation given at the 2015 REASON Spring School, Munich, Germany, March 4-7.
- Henderson, JB, Osborne, J, **MacPherson, A** & Szu, E, Friend, M, Wild, A. IRT Analysis of Items Probing a Unidimensional Learning Progression for Argumentation of Increasingly Complex Structure. Paper presented at the 2014 Annual Meeting of the National Association of Research in Science Teaching (NARST), Pittsburgh, PA.
- Osborne, JF, Henderson, JB, **MacPherson, A** & Szu, E. Building a Learning Progression for Argumentation in Science. Fall 2013 Conference of the Society for Research on Educational Effectiveness. Washington DC, Sept 27-28.

- Osborne, J, Henderson, JB, **MacPherson, A** & Szu, E. Building a learning progression for argumentation in science education. Paper accepted to AERA, San Francisco, April 2013.
- Osborne, J, Henderson, JB, **MacPherson, A** & Szu, E. Developing assessment for a learning progression in argumentation: lessons learned. Paper accepted to NARST, Puerto Rico, April 2013.
- Osborne, J, Henderson, JB, **MacPherson, A** & Szu, E. Assessing Scientific Argumentation by Middle School Pupils and Testing a Learning Progression for Argumentation. Presentation at the annual meeting of the American Educational Research Association (AERA), Vancouver, B.C., April 2012.
- **MacPherson, A** & Osborne, JF. There's more to science than recall: an analysis. Presentation at the National Association for Research in Science Teaching (NARST), Indianapolis, March 2012.

Workshops for Practitioners

- Osborne, J., **MacPherson, A**, Henderson, JB, & Wild, A. Arguing from Evidence in Middle School Science: Why and How. 2019 National Science Teachers Association Meeting, St. Louis.
- **MacPherson, A**, Binding, M & Nagle, B. Developing Science Practices: Constructing Explanations and Engaging in Argumentation. 2019 National Science Teachers Association Meeting, St. Louis.
- **MacPherson, A**, Binding, M & Nagle, B. Argumentation in Context to Enhance Students' Three-Dimensional Learning. 2019 National Science Teachers Association Meeting, St. Louis.
- **MacPherson, A**. NGSS-designed assessments for a middle school ecosystems unit. 2018 National Science Teachers Association Meeting, Atlanta.
- **MacPherson, A**, Henderson, JB, Wild, A & Osborne, JF. Assessing middle school students' argumentation about the structure of matter. 2015 National Science Teachers Association Meeting, Chicago.
- **MacPherson, A** & Osborne, JF. Improving the testing of scientific reasoning in grade 8 science. California Science Teachers Association Meeting, Pasadena, October 2011.
- **MacPherson, A**. Ocean Acidification: In the lab and in the classroom. Sally Ride Science Educator Institute, Los Angeles, November 2009.

Reviewer, Refereed Journals

- Journal of Research in Science Teaching, Teaching and Teacher Education, International Journal of Science Education, Science Education, Journal of Chemistry Education Research and Practice

Reviewer, Conference Proposals

- American Educational Research Association, National Association for Research in Science Teaching