Curriculum Vitae

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Contact Information

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Education

- Georgia Institute of Technology (Atlanta, GA)
  Doctor of Philosophy in Physics, 2011
  Thesis: *Evaluating and Extending a Novel Course Reform of Introductory Mechanics*
  Advisor: Prof. Michael F. Schatz
  Online
- Georgia Institute of Technology (Atlanta, GA)
  Master of Science in Physics, 2007
- University of Texas at Austin (Austin, TX)
  Bachelor of Science in Physics, 2004

Academic Experience

- 2017 - Present, Associate Professor, Center for Computing in Science Education, University of Oslo
- 2013 - Present, Assistant Professor, Department of Physics and Astronomy, Michigan State University
- 2013 - Present, Leadership Faculty, CREATE for STEM Institute, Michigan State University
- 2011 - 2013, Postdoctoral Researcher, Department of Physics, University of Colorado Boulder
- 2011 - 2013, Research Affiliate, School of Physics, Georgia Institute of Technology
- 2005 - 2011, Graduate Teaching and Research Assistant, School of Physics, Georgia Institute of Technology

Awards and Honors

- 2016 College of Natural Science Teaching Prize, MSU
- 2015 Thomas H. Osgood Memorial Awards for Faculty Excellence in Teaching, MSU
- 2014 STEM Gateway Fellow, College of Natural Science, MSU
- 2011 Tower Award, Georgia Institute of Technology
- 2010 CETL/BP Outstanding Graduate TA Award Finalist, Georgia Institute of Technology
- 2009 CETL/BP Outstanding Graduate TA Award, Georgia Institute of Technology
- 2007 – 2008 Teaching Assistant of the Year, American Association of Physics Teachers
- 2007 - 2011 Gozuieta Fellow, Georgia Institute of Technology
- 2007 Travel Grant, Technical University of Denmark
- 2006 Tower Award, Georgia Institute of Technology

Funding

Awarded

1. WebCAT, CREATE for STEM Seed Grant, 02/01/17-01/31/18, $5000
   M.D. Caballero (PI), P.W. Irving (Co-PI)
2. Center for Computing in Science Education, National Research Council of Norway, 01/01/17 - 12/31/26, $1,500,000
   A. Mathe-Sørenson (PI), Morten Hjorth-Jensen (Co-PI), Ellen Karoline Henriksen (Co-PI), Cathrine Wahlstrøm Tellefsen (Co-PI), Knut Mørken (Co-PI), M.D. Caballero (Research Lead)
3. Integrating Equitable Computational Science into High School Science Courses, Science and Society at State, 01/01/17 - 12/31/17, $10,000
   D. Stroupe (PI), N. Shah (Co-PI), M.D. Caballero (Co-PI)
4. Research Experience for Undergraduates in Physics, NSF, 06/01/16 - 05/31/21, $652,201
   S. Tessmer (PI), S. Pratt (Co-PI), M.D. Caballero (Co-PI), G. Westfall (Co-PI)
5. Learning Science by Doing Science: Project-based Learning through Urban Entomology, Science and Society at State, 01/01/16 - 12/31/16, $10,000
   P. White (PI), D. Stroupe (Co-PI), M.D. Caballero (Co-PI)
6. Collaborative Research: Integrating Computation into Undergraduate Physics: A Faculty Development Approach to Community Transformation, NSF, 09/01/15 - 08/31/19, $1,279,209, $503,977 (MSU Part)
   M.D. Caballero (PI, MSU), K. Roos (PI, Bradley), L. Engelhardt (PI, FMU), M. Lopez (PI, St. Thomas), R. Hilborn (PI, AAPT)

7. Collaborative Research: Fostering integration of computational methods in physics courses: A local communities approach, NSF, 07/01/15 – 06/30/17 $219,136, $40,526 (MSU Part)
   M.D. Caballero (PI, MSU), N. Chonacky (PI, Yale), M. Lopez (PI, St. Thomas), R. Hilborn (PI, AAPT)
8. Transforming experiences for science and engineering students: Integrating scientific practices into introductory calculus-based mechanics, LPF-CMP 2, 01/01/14 - 12/31/15, $200,000
   M.D. Caballero (PI, MSU), D. Stroupe (Co-PI), S. Tessmer (Co-PI)
9. InvestigAction: Underrepresented Middle School Youth Becoming Community Engineering Experts, LPF-CMP 2, 01/01/14 – 05/01/15, $125,000
   A. Calabrese-Barton (PI), S. Calabrese-Barton (Co-PI), M.D. Caballero (Co-PI), B. Geier (Co-PI)
10. Collaborative Research: Surveying the state of computational physics in courses for physics majors, NSF, 01/01/15 - 12/31/17, $126,320; 21,380 (MSU Part)
    M.D. Caballero (PI, MSU), N. Chonacky (PI, Yale), R. Hilborn (PI, AAPT)
11. LEVERS: Leveraging Engagement and Vision to Encourage Retention in STEM, HHMI, 09/01/14 – 08/31/19, $1,500,000
    S. Chivukula (PI), M.D. Caballero (Co-author & Physics Project Lead)

Publications

Papers appearing in peer-review journals

1. Irving, P.W., Obsniuk, M.J., and Caballero, M.D. *P3: A Practice Focused Learning Environment*, Am. J. Phys., under review.
2. Pawlak, A., Irving, P.W., and Caballero, M.D. *Development of a modes of collaboration framework*, PR-PER, under review.
3. Caballero, M.D., Doughty, L., Turnbull, A.M., Pepper, R.E., and Pollock, S.J. *Assessing Learning Outcomes in Middle-Division Classical Mechanics: The Colorado Classical Mechanics/Math Methods Instrument*, PR-PER, in review.
4. Laverty, J.T., Underwood, S.M., Matz, R.L., Posey, L.A., Carmel, J.H., Caballero, M.D., Fata-Hartley, C.L., Ebert-May, D., Jardeleza, S.E., Cooper, M.M. *Characterizing College Science Assessments: The Three-Dimensional Learning Assessment Protocol*, PLOS One 11(9): e0162333.
5. Cooper, M.M., Caballero, M.D., Ebert-May, D., Fata-Hartley, C.L., Jardeleza, S.E., Krajcik, J.S., Laverty, J.T., Matz, R.L., Posey, L.A., Underwood, S.M., *Challenge faculty to transform STEM learning*, Science, 350 (6258), 281-282, 2015.
6. Chasteen, S.V., Wilcox, B.R., Caballero, M.D., Perkins, K.K., Pollock, S.J., Wieman, C.E., *Educational transformation in upper-division physics: The Science Education Initiative model, outcomes, and lessons learned*, Phys. Rev. ST Phys. Educ. Res., 11, 020110, 2015.

7. Wilcox, B.R., Caballero, M.D., Baily, C., Sadaghiani, H, Chasteen, S.V., Ryan, Q.X., Pollock, S.J., *Development and Uses of Upper-division Conceptual Assessments*, Phys. Rev. ST Phys. Educ. Res., 11, 020115, 2015.
8. Caballero, M.D., Wilcox, B.R., Doughty, L., Pollock, S.J., *Unpacking students' use of mathematics in upper-division physics*, Eur. J. Phys., 36, 065004, 2015.
9. Ding, L. and Caballero, M.D., *Uncovering the hidden meaning of cross-curriculum comparison results on the Force Concept Inventory*, Phys. Rev. ST Phys. Educ. Res., 10, 2014.
10. Hoskinson, A-M., Couch, B., Hinko, K., Zwickl, B., and Caballero, M.D., *Bridging Physics and Biology Teaching through Modeling*, Am. J. Phys., 82, 434, 2014.
11. Caballero, M.D. and Pollock, S.J., *A Model for Incorporating Computation Without Changing the Course: An example from middle-division classical mechanics*, Am. J. Phys., 82, 231, 2014.
12. Caballero, M.D., Burk, J.B., Aiken, J.M., Douglas, S.S., Scanlon, E.M., Thoms, B.D., and Schatz, M.F., *Integrating Numerical Computation into the Modeling Instruction Curriculum* , Phys. Teach., 52, 38, 2014.
13. Wilcox, B.R., Caballero, M.D., and Pollock, S.J., *Analytic framework for students' use of mathematics in upper-division physics*, Phys. Rev. ST Phys.Educ. Res. 9, 020119, 2013.
14. Hoskinson, A-M., Caballero, M.D. and Knight, J., *Can we improve problem solving in biology? Lessons from 30 years of physics education research*, CBE – LSE, 12, 153, 2013.
15. Chasteen, S.V., Pepper, R.E., Caballero, M.D., Pollock, S.J. and Perkins, K.K., *The Colorado Upper-Division Electrostatics (CUE) diagnostic: A conceptual assessment for the junior level*, Phys. Rev. ST Phys. Educ. Res. 8, 020108, 2012.
16. Caballero, M.D., Kohlmyer, M.A., and Schatz, M.F., *Implementing and assessing computational modeling in introductory mechanics*, Phys. Rev. ST Phys. Educ. Res. 8, 020106, 2012.
17. Caballero, M.D., Kohlmyer, M.A., Schatz, M.F., et al., *Comparing large lecture mechanics curricula using the Force Concept Inventory: A five thousand student study*, Am. J. Phys., 80, 7, 2012.
18. Kohlmyer, M.A., Caballero, M.D., Schatz, M.F., et al., *A Tale of Two Curricula: Performance of two thousand students in introductory electromagnetism*, Phys. Rev. ST Phys. Educ. Res. 5, 020105, 2009.
19. Cochran, A., Barker, E.S., Caballero, M.D., and Gyorgey-Ries, J. *Placing the Deep Impact Mission into Context: Two Decades of Observations of 9P/Tempel 1 from McDonald Observatory*, Icarus 199 (119), 2009.

Papers appearing in peer-reviewed conference proceedings

1. Aiken, J.M. and Caballero, M.D. *Methods for Analyzing Pathways through a*

Physics Major, Proceedings of the Physics Education Research Conference, pp. 28-31, 2016.

2. Caballero, M.D., *Computation across the curriculum: What skills are needed?*, Proceedings of the Physics Education Research Conference, pp. 79-82, 2015.
3. Irving, P.W., Sawtelle, V., and Caballero, M.D., *Troubleshooting Formative Feedback in P3 (A group-based learning environment)*, Proceedings of the Physics Education Research Conference, pp. 155-158, 2015.
4. Laverty, J.T., Cooper, M.M., and Caballero, M.D., *Developing the Next Generation of Physics Assessments*, Proceedings of the Physics Education Research Conference, pp. 187-190, 2015.
5. Pawlak, A., Irving, P.W., and Caballero, M.D., *Identification of a shared answer-making game in group context*, Proceedings of the Physics Education Research Conference pp. 255-258, 2015.
6. Obsniuk, M.J., Irving, P.W., and Caballero, M.D., *A Case Study: Novel Group Interactions through Computational Physics*, Proceedings of the Physics Education Research Conference, pp. 239-242, 2015.
7. Turnbull, A., Doughty, L., Sawtelle, V. and Caballero, M.D., *Student Ideas around Vector Decomposition in the Upper-Division*, Proceedings of the Physics Education Research Conference, pp. 335-338, 2015.
8. Doughty, L., M.D. Caballero, *Rubric Design for Separating the Roles of Open-Ended Assessments*, Proceedings of the Physics Education Research Conference, pp. 71-74, 2014.
9. Laverty, J.T., Tessmer, S.H., Cooper, M.M., Caballero, M.D., *Engaging Physics Faculty in Course Transformation*, Proceedings of the Physics Education Research Conference, pp. 147-150, 2014.
10. Wolf. S.F., Doughty, L., Irving, P.W., Sayre, E.C., Caballero, M.D., *Just Math: A new epistemic frame*, Proceedings of the Physics Education Research Conference, pp. 275-278, 2014.
11. Aiken, J.M., Lin, S., Douglas, S.S., Greco, E.F., Thoms, B.D., Caballero, M.D., Schatz, M.F., *Student Use of a Single Lecture Video in a Flipped Introductory Mechanics Course*, Proceedings of the Physics Education Research Conference,pp. 19-22, 2014.
12. Douglas, S.S., Lin, S., Aiken, J.M., Thoms, B.D., Greco, E.F., Caballero, M.D., Schatz, M.F., *Peer Evaluation of Video Lab Reports in a Blended Introductory Physics Course*, Proceedings of the Physics Education Research Conference, pp. 75-78, 2014.
13. Lin, S., Douglas, S.S., Aiken, J.M., Liu, C., Greco, E.F., Thoms, B.D., Caballero, M.D., Schatz, M.F., *Peer Evaluation of Video Lab Reports in an Introductory Physics MOOC*, Proceedings of the Physics Education Research Conference, pp. 163-166, 2014.
14. Caballero, M.D., Pollock, S.J., *Assessing Student Learning in Middle-Division Classical Mechanics/Math Methods*, Proceedings of the Physics Education Research Conference, pp. 81–84, 2013.

15. Aiken, J.M., Lin, S., Douglas, S.S., Greco, E.F., Thoms, B.D., Schatz, M.F. and Caballero, M.D., *The Initial State of Students Taking an Introductory Physics MOOC*, Proceedings of the Physics Education Research Conference, pp. 53–56, 2013.
16. Caballero, M.D., Wilcox, B.R., Pepper, R.E., and Pollock, S.J. *ACER: A Framework on the Use of Mathematics in Upper-division Physics*, Proceedings of the Physics Education Research Conference, 1513, pp. 90–93, 2012.
17. Wilcox, B.R., Caballero, M.D., Pepper, R.E., and Pollock, S.J., *Upper-division Student Understanding of Coulomb's Law: Difficulties with Continuous Charge Distributions*, Proceedings of the Physics Education Research Conference, 1513, pp. 418–421, 2012.
18. Aiken, J.M., Caballero, M.D., Douglas, S.S., Burk, J.B., Scanlon, E.M., Thoms, B.D., Schatz, M.F., *Understanding Student Computational Thinking with Computational Modeling*, Proceedings of the Physics Education Research Conference, 1513, pp. 46–49, 2012.

Papers contributed to conference proceedings

1. Caballero, M.D., Kohlmyer, M.A., Schatz, M.F., *Fostering Computational Thinking*, Proceedings of the Physics Education Research Conference, 1413, pp. 15–18, 2011
2. Bujak, K.R., Caballero, M.D., Schatz, M.F., et al., *Comparing the Matter and Interactions Curriculum with a Traditional Physics Curriculum: A Think Aloud Study*, Proceedings of the 2011 AERA Annual Meeting, New Orleans, LA, 2011

Service

University Committees

- MSU, University Curriculum Committee, Fall 2016 –
- MSU Dept. of Physics and Astronomy, REU Committee, Spring 2016 –
- MSU Dept. of Physics and Astronomy, Lyman-Briggs/PA Faculty Search Committee, Fall 2015 – Spring 2016
- MSU Dept. of Physics and Astronomy, Algebra-based Physics Review committee, Spring 2014 –
- MSU Dept. of Physics and Astronomy, Calculus-based Physics Review committee, Spring 2014 –
- MSU Dept. of Physics and Astronomy, Undergraduate Program committee, Fall 2013 –
- MSU Dept. of Physics and Astronomy, Instructor Search Committee, Fall 2014 – Spring 2015

- MSU Dept. of Physics and Astronomy, Qualifying Exam committee, Fall 2013 – Spring 2014
- MSU Dept. of Physics and Astronomy, Advising committees (other than own graduate students) for May Lee (Teacher Education)
- Thesis committee for John Aiken, Georgia State University, Atlanta, GA (Fall 2013)

National or International Advisory Committees other than Conferences

- Chair, Group on Physics Education Research for the American Physical Society, Winter 2016 –
- Vice-Chair, Group on Physics Education Research for the American Physical Society, Winter 2015 – Winter 2016
- Member, Research in Physics Education Committee for the American Associate of Physics Teachers, Winter 2015 –
- Chair of the Educational Technologies Committee for the American Association of Physics Teachers, Winter 2013–Winter 2014
- American Journal of Physics, Five Year Review Committee, 2012–2013
- Educational Technologies Committee for the American Association of Physics Teachers, Winter 2010–Winter 2014

Conference Planning and Advisory Committees

- Michigan AAPT/Ohio Section American Physical Society Spring Meeting, East Lansing, MI (2018).
- Michigan AAPT Section Spring Meeting, East Lansing, MI (2015).
- Physics Education Research Conference, Minneapolis, MN (2014).
- MSP Summer Science Academies Concepts in Physical Science (2011).
- Atlanta Metro Physics Teachers Network, Atlanta, GA (2011).
- Atlanta Metro Physics Teachers Network, Atlanta, GA (2010).
- MSP Summer Science Academies Concepts in Physical Science (2009).
- MSP Summer Science Academies Concepts in Physical Science (2008).

Review Panels, Referee

- Reviewer, National Science Foundation
- Referee for Physical Review Special Topics - Physics Education Research, American Journal of Physics, The Physics Teacher, Computers and Education
- Referee for Physics Education Research Conference proceedings

Outreach Activities

- MSU Department of Physics & Astronomy, Physics and Astronomy Day Coordinator w/ K. Hinko (2017).
- MSU Department of Physics & Astronomy, Physics Education Research Seminar coordinator (2014–2016).
- MSU Department of Physics & Astronomy, Graduate Teaching Assistant Workshop coordinator (2014–).
- Science Olympiad, Session coordinator, East Lansing, MI (2014–).
- Grandparent's University at MSU, Session coordinator, East Lansing, MI (2014).

Supervised Research Associates

1. John M. Aiken, August 2016 -
2. William Martinez, August 2015 –
3. Paul W. Irving, May 2014 – August 2016 (Assistant Professor, Michigan State University)
4. Leanne Doughty, January 2014 – January 2016 (Postdoctoral Researcher, University of Colorado Denver)
5. James T. Laverty, August 2013 – August 2016 (Assistant Professor of Physics, Kansas State University)
6. Steven F. Wolf (25%), August 2013 – August 2014 (Assistant Professor of Physics, Eastern Carolina University)

Graduate Students (Main Supervisor)

1. Alanna Pawlak (2013 –)
2. Michael Obsniuk (2013 –)

Graduate Students (Co-supervisor)

1. Kelsey Funkhouser (2015 – , w/ Asst. Prof. Vashti Sawtelle)
2. John Aiken (Georgia State, Master's Thesis, 2013)

PhD students on temporary projects (summer etc)

1. Thomas Finzell (FAST Fellowship, 2013 – 2014)
2. Adam Fritsch (FAST Fellowship, 2013 – 2014)

Collaborating PhD students (Other Departments)

1. May Lee (Teacher Education, 2013 –)
2. James Brian Hancock II (Teacher Education, 2013 –)

Ph.D. Thesis Committee service (not supervised/co-supervised students)

1. Thomas Finzell (Astronomy, Observational)
2. Forrest Phillips (Physics, High Energy)
3. Christopher Minter (Chemistry, Education)
4. May Lee (Teacher Education)

Undergraduate Students supervised on research

1. Anna Turnbull (MSU, Fall 2014, Spring 2015, Summer 2015, Fall 2015)
2. Sarah Boyer (REU - Spring Arbor University, Summer 2016)
3. Paul Hamerksi (REU – Carnegie Mellon University, Summer 2015)
4. Laura Hunter (REU – Mt. Holyoke College, Summer 2015)
5. Sonny Ly (MSU, Spring 2014, Summer 2014, Fall 2014, Spring 2015)
6. Claire Morrison (MSU, Fall 2013, Spring 2014, Summer 2014, Fall 2014, Spring 2015)
7. Keenan Noyes (MSU, Fall 2013, Spring 2014, Fall 2014, Spring 2015)
8. Zach Nusbaum (MSU, Fall 2013, Spring 2014, Summer 2014, Fall 2014, Spring 2015)
9. Brandon Ewert (MSU, Spring 2014)
10. Max Smith (MSU, Fall 2013, Spring 2014)

Undergraduate Students supervised on teaching

1. Madelyn Klinkoski (Fall 2015)
2. Brandon Bilinski (Fall 2015)
3. Lauren Constantini (Fall 2015)
4. Brandon Roek (Fall 2015)
5. Ashley O'Brien (Fall 2015)
6. Steven Collareno (Spring 2015, Fall 2015)
7. Katherine Wampler (Spring 2015, Fall 2015)
8. Melissa Buchelli (Spring 2015)
9. Tyler Hoffman (Spring 2015)
10. Karen Davidge (Spring 2014, Spring 2015)
11. Stephanie Schmidt (Spring 2015)