Philip D. Eaton

Curriculum Vitae

PERSONAL DETAILS

Birth:	May 24, 1991
Cell:	(701) 721-4366
Email:	philip.eaton@montana.edu

EDUCATION

Master of Science in Physics May, 2016
Montana State University GPA: 3.86/4.0

Bachelor of Science in Physics May, 2014
University of North Dakota Summa Cum Laude, GPA: 4.0/4.0

Bachelor of Science in Mathematics May, 2014
University of North Dakota Summa Cum Laude, GPA: 4.0/4.0

PROFESSIONAL EXPERIENCE

Graduate Teaching Assistant 2014 – Present
Montana State University – Department of Physics

Lab Instructor or Lead Instructor for physics classes offered by the physics department.

HONORS AND AWARDS

2016 Fall Outstanding GTA Award Montana State University – Department of Physics

2015 Outstanding GTA Award Montana State University – Department of Physics

ACADEMIC COMMITTEE SERVICE

Member of the Graduate Admissions Committee 2017 – Present
Montana State University - Department of Physics

Helped develop and improve a "preliminary sorting algorithm" for the graduate admission process to helped expedite the graduate admission process.

Member of the Graduate Curriculum Committee 2016 – 2018
Montana State University - Department of Physics

Liaison between the physics graduate students and the physics department.

Member of the Graduate Recruiting Committee 2016 – 2018
Montana State University - Department of Physics

Organized the "Recruiting Weekend" and assisted in recruitment efforts for the physics department. Our main goal while I was in this position was increasing the number of applications the department received, specifically from underrepresented groups in physics.

Member of the Graduate Exams Committee 2016 – 17 & 18 – 19
Montana State University - Department of Physics

Assisted in the construction and policies of the written/oral comprehensive exam for first year graduate students and second year students retaking the exam.

PROFESSIONAL COMMITTEE/REFEREE SERVICE

Academic Journal Referee 2017 – Present
Phys. Rev. PER

RESEARCH INTERESTS

Assessment Analysis
Use psychometric tools to investigate student response data for commonly used assessments to probe the statistical structure of the instrument pre- and post-instruction.
World View Analysis
Use psychometric tools, such as factor analysis, to investigate student response data to uncover stable/unstable student world views for pre- and post-instruction results as measured by conceptual instruments.
Assessment Construction
Building and validating new and/or improved assessments for physics topics from the introductory level to the graduate level.

SKILLS

Software: R, Python, Mathematica, LaTeX
Psychometrics: Exploratory Factor Analysis, Confirmatory Factor Analysis, Item Response Theory, Multi-trait Item Response Theory, Classical Test Theory

TEACHING EXPERIENCE

Graduate Statistical Mechanics Spring 2019
Montana State University - Department of Physics – Co-Instructed with Dr. Keith Johnson

Grad. Written Comp. Prep. Summer 2017, Summer 2018
Montana State University - Department of Physics

Physics III (w/ calculus) Summer 2017, Summer 2018, Fall 2018
Montana State University - Department of Physics

Honors General and Modern Physics II (w/ calculus) Spring 2017, Spring 2018
Montana State University - Department of Physics

Physics II (w/ calculus) Summer 2016, Summer 2017
Montana State University - Department of Physics

Physics I (w/ calculus) Summer 2016
Montana State University - Department of Physics

Physics by Inquiry Spring 2016
Montana State University - Department of Physics

College Physics I (w/ algebra) Summer 2015
Montana State University - Department of Physics

OUTREACH EVENTS AND INFORMAL EDUCATION

"Gravity Check" Demo Organizer 2018
Montana State University - eXtreme Gravity Institute
Organized demonstrations for the Roller Derby event "Gravity Check" which was held in September.

MSU Explore: Earth & Space Science Camp 2016/17/18
Montana State University - Extended University
A 1 week classes about Electricity and Magnetism (2017/18), and a class about Gravitation (2016)

Peaks and Potentials Science Camp 2017/18
Montana State University - Extended University
A 1 week class about Electricity and Magnetism

Nano/Micro Day (MSU Family Science Day) 17/18
Montana State University - Extended University
Presented/explained mechanics, E&M, and general relativity demos for children and their families.

Outreach team member 2016 – 2018
Montana State University - eXtreme Gravity Institute
Constructed lesson plans for topics in Gravitation to be used in K – 12 classes. Ran outreach booths for Astronomy and Aerospace Day in 2017/18 where I presented/explained general relativity demos to children and their families.

RESEARCH COLLABORATIONS

Physics Inventory of Quantitative Literacy – University of Washington
PI: Dr. Suzanne Brahmia (Lead), Dr. Trevor I. Smith, and Dr. Andrew Boudreaux

RESEARCH MENTORING

• **Kinsey Vavruska:** Undergraduate – Physics – *Montana State University*
Brief Description of Research: Using a data set of more than 20,000 student responses to the Force Concept Inventory (FCI), the results of past studies which reported statistical characteristics of the FCI were verified and validated. Statistical methods used included Classical Item Analysis, Unidimensional Item Response Theory, and Item Response Curves (IRCs), and the development of item response difference curves (IRDC); which were all coded in *R* by Kinsey.
• **"Exploring the pre- and post-instruction non-Newtonian worldviews as measured by the force concept inventory"** Eaton, Philip, **Kinsey Vavruska**, and Shannon Willoughby. (In-review)

• **Strother Cooper:** Undergraduate – Physics – *Montana State University*
Brief Description of Research: Strother began by writing Python code for Classical Item Analysis, Item Response Curves, and item parameter estimation for Unidimensional Item Response Theory. After sufficiently learning the theory behind Multi-trait Item Response Theory, Strother used the *R* based software 'mirt' to generate an exploratory model for the CSEM using over 5000 posttest student responses. Strother then confirmed his model using another, independent, sample of over 5000 posttest student responses.
• *McNair Poster Presentation:* **"Preliminary statistical results for the CSEM using classical test theory." Cooper, Strother**, Barrett Frank, Philip Eaton, and Shannon Willoughby. (Fall 2018)

LIST OF PRESENTATIONS AND WORKSHOPS

• *Are you testing what you think you are testing? An introduction into Factor Analysis.* – American Association of Physics Teachers Winter Meeting, Jan '19
• *PERC Poster Presentation* **Smith, Trevor I.** (Presenter), Suzanne W. Brahmia, Alexis Olsho, Andrew Boudreaux, Philip Eaton, Paul A. Kelly, Kyle J. Louis, Mitchell J. Nussenbaum, and Louis J. Remy. **"PIQL: Physics Inventory of Quantitative Literacy."** (2018)
• *Research Programs in Physics* – Montana State University, Fall 2017 & 18
Presented research currently taking place in Montana State University's Physics Education Research group to encourage undergraduate students to begin work with our research group.
• *Graduate Research Programs in Physics* – Montana State University, Spring 2019
Presented research currently taking place in Montana State University's Physics Education Research group to encourage graduate students to begin work with our research group.

PUBLICATIONS

• Eaton, Philip, and Shannon Willoughby. **"Exploring post-instruction alternative worldviews measured by the conceptual survey of electricity and magnetism"** (In-process)

• Eaton, Philip, Keith Johnson, and Shannon Willoughby. **"Examining changes of student ability along multiple latent traits on the force concept inventory using multi-trait item response theory."** (In-process)

• Eaton, Philip, Barrett Frank, and Shannon Willoughby. **"An exploratory/confirmatory factor analysis of the brief electricity and magnetism assessment and the conceptual survey of electricity and magnetism."** (In-process)

• Kalinowski, Steven and Philip Eaton. **"How best to estimate reliability using item response theory and Bayesian estimates of student ability."** *Applied Measurement in Education* (In-review)

• Eaton, Philip, Kinsey Vavruska, and Shannon Willoughby. **"Exploring the pre- and post-instruction non-Newtonian worldviews as measured by the force concept inventory."** *Physical Review Physics Education Research* (In-review)

• Smith, Trevor I., Suzanne W. Brahmia, Alexis Olsho, Andrew Boudreaux, Philip Eaton, Paul A. Kelly, Kyle J. Louis, Mitchell J. Nussenbaum, and Louis J. Remy. **"PIQL: Physics Inventory of Quantitative Literacy."** *Physical Review Physics Education Research* (in-review)

• Eaton, Philip, Keith Johnson, Barrett Frank, and Shannon Willoughby. **"Classical test theory and item response theory comparison of the brief electricity and magnetism assessment and the conceptual survey of electricity and magnetism."** *Physical Review Physics Education Research* 15.1 (2019)

• Eaton, Philip, and Shannon D. Willoughby. **"Confirmatory factor analysis applied to the Force Concept Inventory."** *Physical Review Physics Education Research* 14.1 (2018).