

FRANCES A. BROWN

428 Dalton Run Rd, Johnstown, PA 15905

Phone: (203) 209-3637

Email: fbrown@rdm-gjwa.com

EDUCATION

- | | | |
|------|---|--|
| 2010 | Ph.D. Physics | Kansas State University (KSU) |
| | Dissertation: <i>Facilitating Problem Solving In Introductory Physics</i> | |
| | Advisor: Dr. N. Sanjay Rebello | |
| 2005 | B.S. Physics & Applied Mathematics | Rensselaer Polytechnic Institute (RPI) |
| | Advisor: Dr. Saroj K. Nayak | |

EMPLOYMENT

- | | |
|----------------|--|
| 2019 – Present | Director of Laboratory, Primary Analyst RDM Laboratory, LLC |
| | Contact: Mr. Michael Kerr |
| 2018 – 2019 | Laboratory Technician/ Analyst in Training, RDM Laboratory, LLC |
| | Contact: Mr. Martin S. Ward |
| 2010 - 2017 | Assistant Professor of Physics, Penn State Altoona |
| | Contact: Dr. Gary Weisel |
| 2009 – 2010 | Visiting Assistant Professor of Physics, Penn State Altoona |
| | Contact: Dr. Gary Weisel |
| 2006 – 2009 | Graduate Research Assistant, Physics Education Research Group, KSU |
| | Contact: Dr. N. Sanjay Rebello |
| 2005 – 2006 | Graduate Teaching Assistant, Physics Department, KSU |
| | Contact: Dr. N. Sanjay Rebello |

TEACHING

Adjunct Course at Shepherd University

1. Online Physics 221: Calculus based introductory physics covering electricity, magnetism, circuits, induction, optics, and introduction to quantum. Zoom/YouTube lectures and at home laboratory. Fall 2021.

Courses taught at Penn State Altoona

1. Calculus-based introductory physics I for engineering students covering mechanics, momentum and energy conservation, gravitation, and harmonic oscillators.
2. Calculus-based introductory physics II for engineering students covering electricity, magnetism, circuits, electromagnetism and induction.
3. Calculus-based Modern Physics for Physics Majors covering relativity, quantum theory, and statistical mechanics with applications in atomic, molecular, solid state, nuclear, and elementary particle physics.

4. Algebra-based physics I for biology and engineering technology students covering mechanics, thermodynamics, fluids, and waves.
5. Algebra-based physics II for biology and engineering technology students covering electrostatics circuits, magnetism and optics.
6. Conceptual Physics for liberal arts majors covering Newton's Laws, energy, momentum, electricity and magnetism, waves, sound, heat and temperature, and light and radiation.

Courses taught at Kansas State University as a Teaching Assistant

1. Calculus-based physics covering mechanics, waves, fluids, thermodynamics, electricity and magnetism, circuits, optics, and basic relativity principles electrostatics circuits, magnetism and optics.
2. Calculus-based electronics covering analysis, simulation, and design of analog and digital circuits including filters, diode circuits, transistor circuits, operational amplifiers, logic gates, flip-flops, combinatorial and sequential circuits, and analog to digital to analog converters. Simulations were completed using MultiSim Electronic Workbench and National Instruments LabVIEW software.
3. Conceptual-based physics covering Newton's laws, kinematics, work and energy, electricity, magnetism, waves, sound, heat and temperature, light and radiation.

RESEARCH

My dissertation project focused on the development of curricular strategies that facilitate a common pre-existing novice problem solving practice. Physics students will often select examples to assist themselves with homework problems by identifying similar surface features. For example, if a homework problem has a rollercoaster in it, the student will often select an example by finding one that also contains a rollercoaster. Unfortunately, the example and homework problem containing similar surface features do not necessarily share physical principles. This sometimes makes the student-selected example inappropriate and unreliable as a resource. Yet the method of using examples is a practical cornerstone in the development of a solid problem solving repertoire. I investigated the effectiveness of explicit, analogous problem comparisons in weekly focus groups made up of 8-12 engineering physics students over three consecutive semesters. These problem comparison tasks were structured to elicit focus on physically relevant resources in lieu of surface context. I examined students' perceptions of the problem comparison tasks, and used data collected on students' perceptions to provide the best motivators for individual participation. Students successfully selected more physically meaningful and analogous problems on their own by the end of each semester long treatment, and overall performance in the course was moderately statistically higher. (Statistical significance was limited by the small group sizes.)

While at Altoona, the study was repeated under a full classroom environment with introductory algebra-based physics students over three years, and engineering based physics students for one year. The goal was to refine the success of the initial project design by seeing similar higher performance (gain) scores on problem solving tasks without generating a cumbersome curricular methodology. Many of the more successful educational strategies created

by physics education researchers are met with resistance from institutions, instructors, and students if they are unable to meet the demands of the time on task, or if the resources are unavailable. Penn State Altoona does not have a fleet of graduate teaching assistants, or a multitude of open laboratory classrooms, so any curricular design is limited to that which one instructor can implement. My own work contends that the problem comparison tasks do not have to be closely controlled, just as long as the cognitive goal remains explicit during the implementation of the strategy. I have been successful at constructing a less “intrusive” implementation and continue to use it in my classroom to this day.

My research interests also include a study of scientific ethics following a rather surprising and uneasy conversation with a past student. Noting a lack of research involving STEM students’ understanding of scientific ethics, I generated a qualitative survey to better understand how scientific ethics is perceived by physical science, engineering, and pre-medical students at Penn State Altoona. Preliminary results indicate that a large number of students believe obtaining assistance in formal academic exercises (papers, lab reports, take home exams) is not cheating if the student has resolved some confusion in their own understanding. In other words, if they feel like they’ve learned something while cheating, it is not cheating. This survey continued to be used at the beginning of each semester while undergoing minor adjustments and reliability assessment. As of Spring 2015, the assessment was offered at two other institutions, bringing promise that such a utility may bring about more broad understanding of student epistemological stance on collaboration and academic ethics. Further preliminary results indicate that the survey acts to inhibit cheating by making institutional policy more explicit at the beginning of the semester.

The university wide drive toward more MOOC-based classrooms (Massive Open Online Coursework) led me to draft a generalized curriculum for a new online Rocket Science course. Pedagogically, the course aligns towards discovery based learning methodologies, where students are challenged to build, test out, and successfully navigate a rocket out of Earth’s atmosphere. Mechanical physics (including circular motion and gravitational motion) and thermal physics are taught through the use of a videogame-style simulator called “Kerbal Space Program.” In the early stages of course curriculum development, I made the determination that a course like this would be best offered as a general science elective. The most significant hurdle faced in the course design as of yet is sustaining interest while productively learning advanced algebraic manipulation, and overcoming failed launch attempts. Further development would likely incorporate the use of “Universe Sandbox²,” a powerful, accurate, and cheap to purchase, orbital simulator.

PEER-REVIEWED PUBLICATIONS

1. Mateycik, Fran A., and Kendra E. Sheaffer. "Assessing Students' Epistemic Logic using Clause Topics during Problem Comparison." American Institute of Physics Conference Proceedings, Philadelphia PA, August 1-2, 2012, pages 286-289.
 2. Mateycik, Fran A., and Kendra E. Sheaffer. "Using Students' Ratings of Problem Similarity to Assess Course-Integrated Contrast and Compare Activities." Proceedings of the Annual Meeting of the National Association for Research in Science Teaching, Orlando FL, April 3-6, 2011. CD publication, 22 pages.
 3. "Students' Rating of Problem Similarity as a Measure of Problem-Solving Expertise," Fran Mateycik, David Jonassen, and N. Sanjay Rebello, Proceedings of the Annual Meeting of the National Association for Research in Science Teaching, March 20-24, 2010, Philadelphia, PA.
 4. "Case Reuse in Algebra-Based Physics: Implementation of Facilitating Strategies," Fran Mateycik, David Jonassen, and N. Sanjay Rebello, Proceedings of the Annual Meeting of the National Association for Research in Science Teaching, March 20-24, 2010, Philadelphia, PA.
 5. "Using Similarity Rating Tasks to Assess Case Reuse in Problem Solving," Fran Mateycik, David Jonassen, and N. Sanjay Rebello, AIP Conf. Proc., July 29-30, 2009, Ann Arbor, MI.
 6. "Facilitating Case-based Reasoning in Physics Problem Solving," Fran Mateycik, David Jonassen, and N. Sanjay Rebello, Proceedings of the Annual Meeting of the National Association for Research in Science Teaching, April 17-21, 2009, Garden Grove, CA.
 7. "*Do structure maps facilitate expert-like problem solving strategies in physics?*," Fran Mateycik, David Jonassen, and N. Sanjay Rebello. Proceedings of the Annual Meeting of the National Association for Research in Science Teaching, April 17-21, 2009, Garden Grove, CA.
 8. "Students' Use of Structure Maps to Facilitate Problem Solving in Algebra-Based Physics," Fran Mateycik, David Jonassen, N. Sanjay Rebello, AIP Conf. Proc., July 24-25, 2008, Edmonton, AB Canada.
 9. "Students' Perceptions of Case-Reuse Based Problem Solving in Algebra-Based Physics," Fran Mateycik, Zdeslav Hrepic, David Jonassen, N. Sanjay Rebello, AIP Conf. Proc. Vol 951 pp. 144-147. 2007.
 10. "Student Descriptions of Refraction and Optical Fibers," Fran Mateycik, DJ Wagner, JJ Rivera, Sybillin Jennings, AIP Conf. Proc. Vol 790:1 pp.169-172. 2004.
 11. "Using Electronic Interviews to Explore Student Understanding," DJ Wagner, JJ Rivera, Fran Mateycik, Sybillin Jennings, AIP Conf. Proc. Vol 790: 1 pp. 201-204. 2004.
-

INVITED AND CONTRIBUTED TALKS, WORKSHOPS AND POSTERS

1. “Fundamentals of STEM in Alternative Spring Break Educational Programs” Fran Mateycik. Contributed Talk, Penn State University Annual Science Meeting, University Park Campus, April 2015.
2. “Academic Integrity Amongst Physics and Engineering Students.” Fran Mateycik. Invited Physics Seminar Speaker, Miami University Department of Physics, Oxford, Ohio, April 16, 2014.
3. “Tethering Ethics to the Academic Pursuit: The Ethics Survey” Fran Mateycik. Contributed Poster, Physics Education Research Conference, Minneapolis, MN, July 2014.
4. “Using Context-Rich Problems to Elicit Group Work Outside the Classroom” Fran Mateycik and Timothy Hooper. Contributed Poster, AAPT Meeting, New Orleans LA, January 2013. Invited.
5. “Using Clause Topics to Assess Students’ Reasoning while Comparing Problems” Fran Mateycik and Kendra E. Sheaffer. Contributed Talk, AAPT Meeting, Philadelphia PA, July - August 2012.
6. “Using Student Provided Problem Comparisons to Observe Epistemic Reasoning Trends” Fran Mateycik and Kendra E. Sheaffer. Contributed Poster, AAPT Meeting, Philadelphia PA, July-August 2012.
7. “Epistemic Knowledge Levels Emergent in Students’ Self-selected Problem Comparisons” Fran Mateycik and Kendra E. Sheaffer. Contributed Poster, AAPT Meeting, Ontario CA, February 2012.
8. “Using Similarity Ratings Surveys to Assess Deep-Structure Feature Emphasis During Problem Comparison,” Fran Mateycik and Kendra E. Sheaffer. Contributed Poster, Physics Education Research Conference, Omaha NE, August 2011.
9. “Assessing Course-Integrated Problem Comparisons Activities Using Similarity Ratings Surveys,” Fran Mateycik and Kendra E. Sheaffer. Contributed Talk, AAPT Meeting, Omaha NE, July-August 2011.
10. “Using Students’ Ratings of Problem Similarity to Assess Course-Integrated Contrasts and Compare Activities” Fran Mateycik, Sean T. Elward, and Kendra E. Sheaffer. National Association of Science Teaching, Orlando FL, April 2011.
11. “Assessing Compare and Contrast Activities Integrated in College Algebra-based Physics,” Fran Mateycik. Contributed Talk, AAPT Meeting, July 20th, 2010. Portland, OR.
12. “Students’ Rating of Problem Similarity as a Measure of Problem-Solving Expertise,” Fran Mateycik, David Jonassen, and N. Sanjay Rebello. Contributed talk, NARST, March 20-24, 2010, Philadelphia, PA.
13. “Case Reuse in Algebra-Based Physics: Implementation of Facilitating Strategies” Fran Mateycik, in “Equity and Ethics Scholar Symposium: Presenting examples of Research into Practice and Practice Informing Research”, NARST, March 20-24, 2010, Philadelphia, PA.
14. “Student Adaptation of Conceptual Schema Using Case Reuse,” Fran Mateycik, David Jonassen, and N. Sanjay Rebello. Contributed Talk, Western Pennsylvania Section Meeting of AAPT, October 3, 2009. Indiana, PA.
15. “Students’ Performance on Similarity Rating and Case Reuseability Tasks”, Fran Mateycik, David Jonassen, and N. Sanjay Rebello. Contributed Talk, AAPT Meeting, July 28, 2009. Ann Arbor, MI.

16. "Students' Performance on Text Editing, Jeopardy, and Problem Posing Tasks", Fran Mateycik, David Jonassen, and N. Sanjay Rebello. Contributed Talk, AAPT Meeting, July 28, 2009. Ann Arbor, MI.
17. "Using Similarity Ratings Tasks to Assess Case Reuse in Problem Solving," Fran Mateycik. Contributed Poster, PERC, July 29-30, 2009, Ann Arbor, MI.
18. "Facilitating Case-based Reasoning in Physics Problem Solving" Fran Mateycik, David Jonassen, and N. Sanjay Rebello, in "Symposium: Multiple Perspectives on Problem Solving in Physics", NARST, April 17-21, 2009, Garden Grove, CA.
19. "*Do structure maps facilitate expert-like problem solving strategies in physics?*" Fran Mateycik, David Jonassen, and N. Sanjay Rebello. Contributed talk, NARST, April 17-21, 2009, Garden Grove, CA.
20. "Assessing Case Reuse Strategies Using Non-traditional Physics Problems," Fran Mateycik, David Jonassen, and N. Sanjay Rebello. Contributed Talk, AAPT Meeting, February 14, 2009. Chicago IL.
21. "Group Learning Interviews to Facilitate Case-Reuse in Problem Solving," N. Sanjay Rebello, Fran Mateycik, and David Jonassen. Contributed Talk, AAPT Meeting, February 14, 2009. Chicago IL.
22. "Text-Editing, Problem Posing, and Jeopardy Tasks in Introductory Physics" Fran Mateycik, David Jonassen, and N. Sanjay Rebello. Contributed Talk, AAPT Meeting July 22, 2008. Edmonton, AB Canada.
23. "Group Learning Interviews to Facilitate Problem Solving Using Structure Maps" N. Sanjay Rebello, Fran Mateycik, and David Jonassen. Contributed Talk, AAPT Meeting July 22, 2008. Edmonton, AB Canada.
24. "Use of Structure Maps To Facilitate Problem Solving In Algebra-Based Physics" Fran Mateycik, David Jonassen, and N. Sanjay Rebello. Contributed Poster, PERC July 24-25, 2008. Edmonton, AB Canada.
25. "Students' Perceptions of Research-Based Problem Solving Strategies in Physics" Fran Mateycik, Zdeslav Hrepic, David Jonassen and N. Sanjay Rebello. Contributed Talk, A-O-K Section Meeting of the AAPT October 16, 2007. Conway, AR.
26. "How Upper-division Physics Students Respond to a Studio Laboratory Activity" Fran Mateycik, Dyan McBride, N. Sanjay Rebello, and Christopher M. Sorensen. Contributed Talk, AAPT Meeting July 27, 2007. Greensboro, NC.
27. "Preliminary Implementation of Case-Reuse in Algebra-based Physics" Fran Mateycik, N. Sanjay Rebello, Zdeslav Hrepic, and David Jonassen. Contributed Poster, AAPT Meeting July 27, 2007. Greensboro, NC.
28. "Studio Optics: Upper-division Implementation of Studio Format ? A First Look" Dyan McBride, Fran Mateycik, N. Sanjay Rebello, and Christopher M. Sorensen. Contributed Poster, AAPT Meeting July 27, 2007. Greensboro, NC.

29. "Facilitating Case-Reuse in Algebra-based Physics" Fran Mateycik, N. Sanjay Rebello, Zdeslav Hrepic, and David Jonassen. Contributed Poster, PERC August 1, 2007. Greensboro, NC.
30. "Exploring the Studio Format in an Upper-Division Optics Course: A First Look" Fran Mateycik, N. Sanjay Rebello. Contributed Talk, A-O-K Section Meeting of the AAPT October 16, 2006. Emporia, KS.
31. "W30: SciT: A Modular, Web-Based Curriculum Connecting Introductory Physics to technological Applications" DJ Wagner, Fran Mateycik. Workshop, 130th AAPT Meeting Jan 9, 2005. Albuquerque, NM.
32. "Student Descriptions of Refraction and Optical Fibers" Fran Mateycik, DJ Wagner, JJ Rivera, and Sybillyn Jennings. Contributed Poster, PERC August 4-5, 2004. Sacramento, CA.
33. "Using Electronic Interviews to Explore Student Understanding" DJ Wagner, JJ Rivera, Fran Mateycik, and Sybillyn Jennings. Contributed Poster, PERC August 4-5, 2004. Sacramento, CA.
34. "Creation of Multimedia Textbook for Contextually-Relevant Introductory Course" DJ Wagner, JJ Rivera, Fran Mateycik, and Sybillin Jennings. Contributed Talk, 129th AAPT Meeting Aug 4 2004. Sacramento, CA.
35. "Using Students' Preconceptions to Improve upon Curricular Materials" Fran Mateycik, DJ Wagner. Contributed Talk, 129th AAPT Meeting Aug 1 2004. Sacramento, CA.
36. "Probing student understanding of total internal reflection and optical fibers using Piaget-style interviews conducted both face-to-face and electronically" DJ Wagner, JJ Rivera, Fran Mateycik, and Sybillyn Jennings. Contributed Poster, PERC August 6-7, 2003. Madison, WI.
37. "Web-Based Materials for Contextual Introductory Physics Course" DJ Wagner, JJ Rivera, Fran Mateycik, and Sybillin Jennings. Contributed Talk, 127th AAPT Meeting Aug 4 2003. Madison, WI.

Active Participation in Professional and Learned Societies

1. Chair, Professional Concerns Committee, American Association of Physics Teachers, February 2013-February 2014.
2. Vice-Chair, Professional Concerns Committee, American Association of Physics Teachers, January 2011-February 2013.
3. Member, Educational Technologies Committee, American Association of Physics Teachers, February 2011-August 2014. Extended membership.

Referee for Journals and Proceedings

1. *Physical Review Special Topics-Physics Education Research*, 1-2 papers per year, Fall 2009-present.
2. *Physics Education Research Conference Proceedings*, 3-4 papers per year, Summer 2004-present.

3. *National Association of Research in Science Teaching Proceedings*, 6-12 proposals per year, Spring 2006-Spring 2012
-

SERVICE

Organizing Conferences

1. Co-organizer, Department of Physics Science Meeting the Pennsylvania State University Annual Science Meeting, Penn State University, University Park Campus, April 2015.
2. Conference Organizer, Western Chapter and Central Chapter, Joint American Association of Physics Teachers Conference, Penn State University, University Park Campus, March 2012.
3. Conference Organizer, Western Pennsylvania Chapter, American Association of Physics Teachers Conference, Penn State Altoona, March 2011.

Service on Conference Committees (Session/Panel Presider for American Association of Physics Teachers is also the organizer, unless noted otherwise.)

1. Presider, "Invited Session FB: Panel: Seeking Employment in Academia," American Association of Physics Teachers Conference, Minneapolis, MN, July 28, 2014.
2. Presider, "Contributed Session GC: Best Practices in Educational Technology II," American Association of Physics Teachers Conference, Minneapolis, MN, July 28, 2014.
3. Presider, "Invited Session AE: Panel: Seeking Employment in Academia," American Association of Physics Teachers Conference, Portland OR, July 15, 2013.
4. Presider, "Contributed Session GG: Best Practices in Educational Technology II," American Association of Physics Teachers Conference, Portland OR, July 17, 2013.
5. Presider, "Invited Session BF: Physics by the #'s: Mobile Communications in the Classroom." American Association of Physics Teachers, Ontario, CA, February 6, 2012.
6. Presider, "Crackerbarrel 1 (Topical Discussion): Crackerbarrel for Physics Education Researchers," American Association of Physics Teachers, Ontario, CA, February 6, 2012.

Participation in Campus and/or University-wide Governance Bodies

1. Member, Faculty Senate, Fall 2011-present.
2. Member, Pre-Professional Health Concerns Committee, Faculty Senate, Fall 2010-present.
3. Vice-Chair, Intercollegiate Athletics Committee, Faculty Senate, Fall 2013-Spring 2014.
4. Chair, Intercollegiate Athletics Committee, Faculty Senate, Fall 2011-Spring 2013.
5. Member, Code of Conduct Task Force, Fall 2010-Spring 2011.

Record of Committee Work at Campus, College, Department and University Levels

1. Member, Peer Review of Teaching Committee for faculty member in Security Risk and Analysis, Spring 2015.
2. Member, Peer Review of Teaching Committee for promotion candidate in Security Risk and Analysis, Spring 2015.
3. Member, Search Committee, Security Risk and Analysis tenure-track faculty position, Fall 2012-Spring 2013.
4. Member, Peer Review of Teaching Committee for faculty member in Security Risk and Analysis, Fall 2013.
5. Member, Peer Review of Teaching Committee for promotion candidate in Engineering,

Spring 2013.

6. Member, Search Committee, Security Risk and Analysis tenure-track faculty position, Fall 2011-Spring 2012.
7. Member, Search Committee, Human and Environmental Geography FTM position, Fall 2012-Spring 2013.
8. Member, Peer Review of Teaching Committee for faculty member in Physics, Fall 2013.
9. Member, Peer Review of Teaching Committee for faculty member in Physics, Spring 2012.
10. Graduate Physics Student Association – President, 2008-2009; Vice President, 2007-2008
11. Colloquium Committee member, Physics Department, Kansas State University, 2006-2007.

Assistance to Student Activities and Organizations

1. Volunteer Assistant Coach for Cross Country, Track and Field at University of Pittsburgh at Johnstown. 2022-Present. Specialty in Strength and Conditioning, Mid-distance, Long distance, jumping.
2. Advisor, Students Committed to Service: Alternative Spring Break-Nicaragua, 2012-2015
3. Advisor, Science Club, Penn State Altoona, Fall 2009-Spring 2015, Spring 2016.
4. Co-organizer, Science Spooktacular Demonstration Show in Misciagna Theatre, and the hands-on activities room, Penn State Altoona, October of 2009-2015.
5. Volunteer, Move-in Day, Penn State Altoona, August 2011, August 2012, August 2014.

Participation in Community Affairs

1. Plenary Speaker for the 2022 Seeding your Future Conference, Shepherd University, Shepherd, WV. October 2022.
2. Presenter, “H2Oh!” Seeding your Future Conference, Shepherd University, Shepherd, WV. October 2019
3. Presenter, “Franny and the Water Treatment Plant” Seeding Your Future Conference, Shepherd University, Shepherd, WV. October 2018
4. Presenter, “Keeping it real: The beauty behind Math in Civil Engineering” Seeding Your Future Conference, Shepherd University, Shepherd, WV. October 2017
5. Presenter, “Towering Paper Inferno” Seeding Your Future Conference, Shepherd University, Shepherd, WV. October 2016
6. Presenter, “Who’s Galloping Girtie, and why did she fail?,” Seeding Your Future Conference, Shepherd University, Shepherd, WV. October 2015.
7. Presenter, “Introduction of the Optics of the Human Eye,” Seeding Your Future Conference, Shepherd University, Shepherd, WV. October 2014.
8. Presenter, “Liquid Nitrogen Physics!” Bellwood-Antis Elementary School, Bellwood PA, March 1, 2013.
9. Presenter, “Liquid Nitrogen Physics!” Bellwood-Antis Elementary School, Bellwood PA, January 11, 2013.
10. Presenter, “Structural Engineering of a Bridge and Truss System,” Science Days, McAuliffe Heights Elementary School, Altoona PA, April 28, 2011.
11. Presenter, “Structural Engineering of a Tower,” Science Days, McAuliffe Heights Elementary School, Altoona PA, February 18, 2011.
13. ‘Girls Researching Our World’ Workshop Leader, Kansas State University, Spring 2008.