

## MEGAN WAWRO

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### EDUCATION

University of California, San Diego 2007-2011 Ph.D. Mathematics and Science Education  
& San Diego State University

Dissertation: *Individual and Collective Analyses of Student Reasoning regarding the  
Invertible Matrix Theorem in Linear Algebra* (Advisor: Chris Rasmussen)

Miami University 2003-2005 M.A. Mathematics

Cedarville University 1996-2000 B.A. Mathematics

### EMPLOYMENT

2016-present Virginia Tech, Associate Professor, Department of Mathematics, Blacksburg, VA

2011-2016 Virginia Tech, Assistant Professor, Department of Mathematics, Blacksburg, VA

2007-2011 San Diego State University, Graduate Research Assistant, Department of  
Mathematics and Statistics, San Diego, CA

2005-2007 Miami University, Visiting Instructor, Department of Mathematics and Statistics,  
Oxford, OH

2005-2007 Summer in Switzerland program at Leysin American School, Mathematics  
Teacher and Residential Life Coordinator ('07), Leysin, Switzerland

2003-2005 Miami University, Graduate Teaching Assistant, Department of Mathematics and  
Statistics, Oxford, OH

2001-2003 Institut auf dem Rosenberg, Mathematics Teacher, St. Gallen, Switzerland

2000-2001 Portsmouth East High School, Mathematics and Art Teacher, Portsmouth, OH

### PUBLICATIONS

#### Papers in refereed journals

Andrews-Larson, C., Wawro, M., & Zandieh, M. (2017). A hypothetical learning trajectory for conceptualizing matrices as linear transformations. *International Journal of Mathematical Education in Science and Technology*, DOI: 10.1080/0020739X.2016.1276225.

Zandieh, M., Wawro, M., & Rasmussen, C. (2017). Inquiry as participating in the mathematical practice of symbolizing: An example from linear algebra. *PRIMUS*, 27(1), 96-124. DOI 10.1080/10511970.2016.1199618

Wawro, M. (2015). Reasoning about solutions in linear algebra: The case of Abraham and the Invertible Matrix Theorem. *International Journal of Research in Undergraduate Mathematics Education*, 1(3), 315-338.

- Plaxco, D., & Wawro, M. (2015). Analyzing student understanding in linear algebra through mathematical activity. *Journal of Mathematical Behavior*, 38, 87-100.
- Rasmussen, C., Wawro, M., & Zandieh, M. (2015). Examining individual and collective level mathematical progress. *Education Studies in Mathematics*, 88(2), 259-281.
- Selinski, N., Rasmussen, C., Wawro, M., & Zandieh, M. (2014). A methodology for using adjacency matrices to analyze the connections students make between concepts: The case of linear algebra. *Journal for Research in Mathematics Education*, 45(5), 550-583.
- Wawro, M. (2014). Student reasoning about the invertible matrix theorem in linear algebra. *ZDM The International Journal on Mathematics Education*, 46(3), 1-18.
- Wawro, M., Rasmussen, C., Zandieh, M., Sweeney, G., & Larson, C. (2012). An inquiry-oriented approach to span and linear independence: The case of the Magic Carpet Ride sequence. *PRIMUS: Problems, Resources, and Issues in Mathematics Undergraduate Studies*. 22(8), 577-599.
- Becker, N., Rasmussen, C., Sweeney, G., Wawro, M., Towns, M., & Cole, R. (2012). Reasoning using particulate nature of matter: An example of a sociochemical norm in a university-level physical chemistry class. *Chemistry Education Research and Practice*, 14, 81-94.
- Cole, R., Becker, N., Towns, M., Sweeney, G., Wawro, M., & Rasmussen, C. (2012). Adapting a methodology from mathematics education research to chemistry education research: Documenting collective activity. *International Journal of Science and Mathematics Education*, 10, 193-211.
- Nemirovsky, R., Rasmussen, C., Sweeney, G., & Wawro, M. (2012). When the classroom floor becomes the complex plane: addition and multiplication as ways of bodily navigation. *Journal of the Learning Sciences*, 21(2), 287-323.
- Wawro, M., Sweeney, G., & Rabin, J. M. (2011). Subspace in linear algebra: Investigating students' concept images and interactions with the formal definition. *Educational Studies in Mathematics*, 78(1), 1-19.

### **Book Chapters**

- Rasmussen, C., & Wawro, M. (2017). Post-calculus research in undergraduate mathematics education. In J. Cai, (Ed.), *The compendium for research in mathematics education*. Reston VA: National Council of Teachers of Mathematics.
- Wawro, M. (2016). Finding synergy among research, teaching, and service: An example from mathematics education research. In J. Dewar, P. Hsu, & H. Pollatsek (Eds.), *Mathematics Education: A Spectrum of Work in Mathematical Sciences Departments* (pp. 135-145). Springer International Publishing.
- Wawro, M., Rasmussen, C., Zandieh, M., & Larson, C. (2013). Design research within undergraduate mathematics education: An example from introductory linear algebra. In T. Plomp, & N. Nieveen (Eds.), *Educational design research – Part B: Illustrative cases* (pp. 905-925). Enschede, the Netherlands: SLO.
- Rasmussen, C., Zandieh, M., & Wawro, M. (2009). How do you know which way the arrows go? The emergence and brokering of a classroom mathematics practice. In W.-M. Roth (Ed.), *Mathematical representation at the interface of body and culture* (pp. 171-218). Charlotte, NC: Information Age Publishing.

## Papers in refereed conference proceedings

- Jaworski, B., Potari, D., Rasmussen, C., Oates, G., Kwon, O.N., Ellis, J., ... Zachariades, T. (2016). *Mathematics Learning and Teaching at University Level*. In Csíkos, C., Rausch, A., & Sztányi, J. (Eds.), *Proceedings of the 40th Conference of the International Group for the Psychology of Mathematics Education, Vol. 1*, pp. 375–404. Szeged, Hungary: PME.
- Wawro, M., & Plaxco, D. (2015). Student understanding of linear independence of functions. *Proceedings of the 9<sup>th</sup> Congress of European Research on Mathematics Education*, Prague, Czech Republic. In K. Krainer, N. Vondrová (Eds.), *Proceedings of the Ninth Congress of the European Society for Research in Mathematics Education (CERME9, 4-8 February 2015)* (pp. 2297-2298). Prague, Czech Republic: Charles University in Prague, Faculty of Education and ERME.
- Wawro, M., & Plaxco, P. (2013). Utilizing types of mathematical activities to facilitate characterizing student understanding of span and linear independence. In S. Brown, G. Karakok, K. H. Roh, and M. Oehrtman (Eds.), *Proceedings of the 16th Annual Conference on Research in Undergraduate Mathematics Education, Volume I* (pp. 1-15), Denver, CO.
- Wawro, M., Larson, C., Zandieh, M., & Rasmussen, C. (2012). A hypothetical collective progression for conceptualizing matrices as linear transformations. In S. Brown, S. Larsen, K. Marrongelle, and M. Oehrtman (Eds.), *Proceedings of the 15th Annual Conference on Research in Undergraduate Mathematics Education* (pp. 1-465 – 1-479), Portland, OR.
- Rasmussen, C., Trigueros, M., Zandieh, M., Possani Espinosa, E., Wawro, M, Sweeney, G., et al. (2010). Building on students' current ways of reasoning to develop more formal or conventional ways of reasoning: The case of linear algebra. In P. Brosnan, D. B. Erchick, & L. Flevaris (Eds.), *Proceedings of the 32nd annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 1577-1587). Columbus, OH: The Ohio State University.
- Rasmussen, C., Zandieh, M., & Wawro, M. (2010). Brokering as a mechanism for the social production of meaning. In P. Brosnan, D. B. Erchick, & L. Flevaris (Eds.), *Proceedings of the 32nd annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 427-434). Columbus, OH: Ohio State University.
- Schwarz, B., Hershkowitz, R., Atzmon, S., Rasmussen, C., Stahl, G., Wawro, M., et al. (2010). Symposium: Social construction of mathematical meaning through collaboration and argumentation. In K. Gomez, L. Lyons, & J. Radinsky (Eds.), *Learning in the Disciplines: Proceedings of the 9th International Conference of the Learning Sciences (ICLS 2010) - Volume 2, Short Papers, Symposia, and Selected Abstracts* (pp. 29-36). International Society of the Learning Sciences: Chicago IL.
- Cole, R., Towns, M., Rasmussen, C., Becker, N., Wawro, M., & Sweeney, G. (2010). Adapting a methodology for documenting collective growth to an undergraduate physical chemistry class. *Proceedings of the 13<sup>th</sup> Annual Conference on Research in Undergraduate Mathematics Education, Raleigh, NC*. Retrieved from: <http://sigmaa.maa.org/rume/crume2010>
- Henderson, F., Rasmussen, C., Sweeney, G., Wawro, M, & Zandieh, M. (2010). Symbol sense in linear algebra. *Proceedings of the 13<sup>th</sup> Annual Conference on Research in Undergraduate Mathematics Education, Raleigh, NC*. Retrieved from: <http://sigmaa.maa.org/rume/crume2010>
- Wawro, M., Sweeney, G., & Rabin, J. M. (2010). Subspace in linear algebra: Investigating students' concept images and interactions with the formal definition. *Proceedings of the 13<sup>th</sup>*

*Annual Conference on Research in Undergraduate Mathematics Education, Raleigh, NC.*  
Retrieved from: <http://sigmaa.maa.org/rume/crume2010>

Wawro, M. (2009). Task design: Towards promoting a geometric conceptualization of linear transformation and change of basis. *Proceedings of the 12<sup>th</sup> Annual Conference on Research in Undergraduate Mathematics Education, Raleigh, NC.* Retrieved from: <http://sigmaa.maa.org/rume/crume2009>

### **Other Papers**

Wawro, M., Ellis, J., & Soto-Johnson, H. (2014). MPWR: Mentoring and partnerships for women in RUME. *Association for Women in Mathematics Newsletter*, 44(5), 20-23.

### **Submitted Publications**

Norton, A., Arvold, B., Kuster, G., Ulrich, C., Wilkins, J., Kreye, B., Hagen, S., & Wawro, M. (in review). Teacher quality as a retrospective assessment of program quality. *Manuscript submitted for publication.*

### **Editor for Conference Proceedings**

Fukawa-Connelly, T., Engelke Infante, N., Wawro, M., & Brown, S. (Eds.). (2016). Proceedings of the 19<sup>th</sup> Annual Conference on Research in Undergraduate Mathematics Education, Pittsburgh, PA.

### **GRANTS**

National Science Foundation Faculty Early Career Development Program through the Division of Undergraduate Education, *CAREER: An Interdisciplinary Study of Learning: Student Understanding of Linear Algebra in Physics* (DUE-1452889), Megan Wawro (PI), 2015-2020, \$779,686.

National Science Foundation Innovations in Undergraduate STEM Education, MATH: EAGER Building a mathematical toolkit and motivation for success in the physical and quantitative sciences (#1544225), J. Sible (PI); K. Drezek, S. Lewis, M. Fleming, A. Robinson (co-PIs), J. Simonetti, M. Wawro (senior personnel), 2015-2017, \$296,996.

National Science Foundation Transforming Undergraduate Education in STEM, *MPWR: Mentoring and Partnerships for Women in RUME* (DUE-1352990), M. Wawro (PI), J. Ellis and H. Soto-Johnson (senior personnel), 2013-2014, \$44,148.

National Science Foundation Transforming Undergraduate Education in STEM, *Collaborative Research: Developing Inquiry-Oriented Instructional Materials for Linear Algebra* (DUE-1245673, 1245796, and 1246083), M. Wawro (PI), M. Zandieh and C. Rasmussen (co-PIs), 2013-2015, \$179,949.

National Science Foundation Robert Noyce Teach Scholarship, *Virginia Teach, Phase II: A Community-Based Approach to Serving Mathematics Students in Need* (DUE-1339947), C. Ulrich (PI), J. Wilkins, B. Kreye, A. Norton, and M. Wawro (co-PIs), 2013-2018, \$800,000.

National Science Foundation Transforming Undergraduate Education in STEM, *MPWR II: Mentoring and Partnerships for Women in RUME* (DUE-1457785), Jessica Ellis (PI); M. Wawro, E. Thanheiser, and S. Musgrave (senior personnel), 2014-2015, \$49,986.

National Science Foundation, *MPWR 2016 and Beyond: Fostering Sustainable Networks for Women in RUME* (DUE-1553278); J. Ellis (PI), S. Musgrave (co-PI), M. Wawro and E. Thanheiser (senior personnel), 2016-2019, \$199,992.

Virginia Tech Center for Innovation in Learning, *Innovation in Undergraduate Mathematics Education: Supporting Student-Centered Instruction*, M. Wawro (PI) and D. Plaxco (co-PI), 2013-2014, \$10,000.

Virginia Tech International Travel Supplement Grant (travel to France), \$1,700, 2016.

Virginia Tech International Travel Supplement Grant (travel to Czech Republic), \$2,000, 2014.

AWM-NSF Travel Grant (for mathematics education researchers attending mathematics conferences), 2013, \$1500.

Virginia Tech International Travel Supplement Grant (travel to S. Korea), 2012, \$2,000.

Virginia Tech Mentoring Grant, 2011, \$1,500.

### INVITED TALKS

Wawro, M. (2017, February). *How to support each other in being successful*. Invited panelist for the 2017 Mentoring and Partnerships for Women in RUME (MPWR) Conference, San Diego, CA.

Wawro, M. (2016, September). *Research on the Learning and Teaching of Diagonalization and Eigentheory of Linear Algebra*. Invited colloquium given at the Maine Center for Research in STEM Education (RiSE Center), University of Maine, Orono, ME.

Wawro, M. (2016, April). *Research on the Teaching and Learning of Linear Algebra*. Invited colloquium given at West Virginia University, Morgantown, WV.

Wawro, M. (2016, March). *Research on the Teaching and Learning of Linear Algebra*. Invited colloquium given at the University of Delaware, Newark, DE.

Wawro, M. (2015, August). *Research on the Learning and Teaching of Linear Algebra*. Invited colloquium given at the Virginia Tech Mathematics Department, Blacksburg, VA.

Rasmussen, C., & Wawro, M. (2015, May). *Representing and modeling with vectors*. Invited workshop for the San Diego Mathematics Project "Getting Ready for College Mathematics: Conversations with Math Professors" series for high school teachers, San Diego, CA.

Wawro, M. (2014, December). *An inquiry-oriented approach to the teaching and learning of linear algebra*. Invited colloquium given at the Colorado State University Mathematics Department, Ft. Collins, CO.

Wawro, M. (2014, April). *Transitioning from doctoral student to faculty member*. Invited talk given at the Graduate Student, Junior Faculty, and Researcher Mentoring Session at the 2014 NCTM Research Conference, New Orleans, LA.

Wawro, M., & Plaxco, D. (2014, January). *Utilizing types of mathematical activities to facilitate characterizing student understanding of span and linear independence*. Invited talk given at the Joint Mathematics Meetings [SIGMAA on RUME Session on Research on the Teaching and Learning of Undergraduate Mathematics], Baltimore, MD.

Wawro, M. (2013, July). *Analyzing student understanding in linear algebra through mathematical activity*. Invited talk given at the 2013 Summer Meeting of the American Association of Physics Teachers [Research in Undergraduate Mathematics Education session], Portland, OR.

- Wawro, M. (2013, April). *Analyzing student understanding in linear algebra through mathematical activity*. Invited colloquium given at the University of North Carolina Charlotte.
- Wawro, M., Sweeney, G., Zandieh, M., & Larson, C. (2011, August). *Designing instruction that builds on students' ways of reasoning in linear algebra*. SIGMAA on RUME invited workshop at MathFest, Lexington, KY.
- Rasmussen, C., & Wawro, M. (2009). *The Role of Brokers in the Reinvention Process*. Invited workshop at the Second Realistic Mathematics Education Conference, Boulder, CO.

## PRESENTATIONS AT PROFESSIONAL MEETINGS

- Wawro, M., Watson, K., & Christensen, W. (2017, February). *Meta-representational competence with linear algebra in quantum mechanics*. Paper presented at the 20th Conference on Research in Undergraduate Mathematics Education, San Diego, CA.
- Watson, K., Wawro, M., Zandieh, M., & Kerrigan, S. (2017, February). *Knowledge about student understanding of eigentheory: Information gained from multiple choice extended assessment*. Paper presented at the 20th Conference on Research in Undergraduate Mathematics Education, San Diego, CA.
- Ellis, J., Musgrave, S., Melhuish, K., Thanheiser, E., & Wawro, M. (2017, February). *Empowered women in RUME: We have we been up to?* Poster presented at the 20th Conference on Research in Undergraduate Mathematics Education, San Diego, CA.
- Wawro, M., Watson, K., & Christensen, W. (2017, February). *Meta-representational competence with linear algebra in quantum mechanics*. Paper presented at the 10<sup>th</sup> Congress of European Research in Mathematics Education, Dublin, Ireland.
- Borum, V., Lovin, L., Wawro, M., & White, N. (2017, January). *Highlighting contributions to mathematics education from members of departments of mathematics sciences*. Panel discussion sponsored by the MAA COMET and the AWM presented at the Joint Mathematics Meetings of the Mathematical Association of America and the American Mathematical Society, Atlanta, GA.
- Ellis, J., Musgrave, S., Wawro, M., Thanheiser, E., & Melhuish, K. (2017, January). *MPWR 2016 and Beyond: Fostering sustainable networks for women in RUME*. Poster presented at the Joint Mathematics Meetings of the Mathematical Association of America and the American Mathematical Society, Atlanta, GA.
- Wawro, M., & Watson, K. (2017, January). *An interdisciplinary study of learning: Student understanding of linear algebra in physics*. Poster presented at the Joint Mathematics Meetings of the Mathematical Association of America and the American Mathematical Society, Atlanta, GA.
- Wawro, M., & Zandieh, M., & Rasmussen, C. (2016, July). *Symbolizing and brokering in fostering inquiry*. Paper presented at the 13<sup>th</sup> International Congress on Mathematical Education, Hamburg, Germany.
- Rasmussen, C., & Wawro, M. (2016, August). *Coordinating analyses of individual and collective mathematical progress*. Paper presented in the "Mathematics Learning and Teaching at University Level" Research Forum at the Psychology of Mathematics Education 40<sup>th</sup> Annual Conference, Szeged, Hungary.
- Wawro, M., & Zandieh, M. (2016, April). *An inquiry-oriented task sequence for eigentheory and diagonalization in linear algebra*. Poster presented at the First Conference of the

International Network for Didactic Research in Undergraduate Mathematics, Montpellier, France.

- Zandieh, M., Wawro, M., & Rasmussen, C. (2016, February). *Symbolizing and brokering in an inquiry-oriented linear algebra classroom*. Paper presented at the Nineteenth Conference on Research in Undergraduate Mathematics Education, Pittsburgh, PA.
- Watson, K., Wawro, M., & Zandieh, M. (2016, February). *Assessing students' understanding of eigenvectors and eigenvalues in linear algebra*. Poster presented at the Nineteenth Conference on Research in Undergraduate Mathematics Education, Pittsburgh, PA.
- Wawro, M., Ellis, J., & Soto-Johnson, H. (2015, April). *Lessons learned from mentioning and partnerships for women in research in undergraduate mathematics education*. Poster presented at the American Educational Research Association (AERA) Annual Meeting, Chicago, IL.
- Wawro, M., Zandieh, M., Rasmussen, C., & Andrews-Larson, C. (2015, February). *An RME-based instructional sequence for change of basis and eigentheory*. Poster presented at the 18<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, Pittsburgh, PA.
- Christensen, W., & Wawro, M. (2015, February). *Education research at the interface of mathematics and physics*. Working group organized at the 18<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, Pittsburgh, PA.
- Rasmussen, C., Wawro, M., & Zandieh, M. (2015, February). *Examining individual and collective level mathematical progress*. Paper presented at the 18<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, Pittsburgh, PA.
- Zandieh, M., Plaxco, D., Wawro, M., Rasmussen, C., Milbourne, H., & Czeranko, K. (2015, February). *Extending multiple choice format to document student thinking*. Paper presented at the 18<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, Pittsburgh, PA.
- Wawro, M., & Plaxco, D. (2015, February). *Student understanding of linear independence of functions*. Poster presented at the 9<sup>th</sup> Congress of European Research on Mathematics Education, Prague, Czech Republic.
- Wawro, M., Zandieh, M., & Plaxco, D. (2015, January). *An instructional sequence for change of basis and eigentheory*. Paper presented at the Joint Mathematics Meetings of the Mathematical Association of America and the American Mathematical Society [MAA Session on Innovative and Effective Teaching of Linear Algebra], San Antonio, TX.
- Zandieh, M., Wawro, M., & Plaxco, D. (2015, January). *Inquiry-Oriented Linear Algebra (IOLA): An RME-based instructional sequence for change of basis and eigentheory*. Paper presented at the Joint Mathematics Meetings of the Mathematical Association of America and the American Mathematical Society [SIGMAA on RUME Session on Research on the Teaching and Learning of Undergraduate Mathematics], San Antonio, TX.
- Wawro, M., Zandieh, M., Rasmussen, C., Larson, C., Plaxco, D., & Czeranko, K. (2014, February). *Developing inquiry oriented instructional materials for linear algebra (DIOIMLA): Overview of the research project*. Poster presented at the Seventeenth Conference on Research in Undergraduate Mathematics Education, Denver, CO.
- Plaxco, D., Wawro, M., & Zietsman, L. (2014, February). *Student understanding of linear independence of functions*. Paper presented at the Seventeenth Conference on Research in Undergraduate Mathematics Education, Denver, CO.

- Larson, C., Wawro, M., Zandieh, M., Rasmussen, C., Plaxco, D., & Czeranko, K. (2014, February). *Implementing inquiry-oriented instructional materials in undergraduate mathematics*. Paper presented at the Seventeenth Conference on Research in Undergraduate Mathematics Education, Denver, CO.
- Plaxco, D., & Wawro, M. (2013, November). *Characterizing student conceptions of span and linear independence through mathematical activity: The case of Joe*. Poster presented at the Thirty-fifth Annual Conference of the North American Chapter of the International Group for the Psychology of Mathematics Education (PME-NA), Chicago, IL.
- Wawro, M. (2013, June). *Designing instruction that builds on students' ways of reasoning in linear algebra: an example from span and linear independence*. Paper presented at the 2013 Meeting of the International Linear Algebra Society, Providence, RI.
- Wawro, M., & Christensen, W. (2013, February). *Investigating student understanding of cross-cutting concepts within undergraduate mathematics and physics*. Working group organized at the 16<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, Denver, CO.
- Wawro, M., & Plaxco, D. (2013, February). *Utilizing types of mathematical activities to facilitate characterizing student understanding of span and linear independence*. Paper presented at the 16<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, Denver, CO.
- Wawro, M. (2013a, January). *Reasoning about solutions in linear algebra: The case of Abraham and the Invertible Matrix Theorem*. Paper presented at the Joint Mathematics Meetings of the Mathematical Association of America and the American Mathematical Society [SIGMAA on RUME Session on Research on the Teaching and Learning of Undergraduate Mathematics], Boston, MA.
- Wawro, M. (2013b, January). *Transitioning from graduate student to faculty member: Learning to lead a research project team*. Poster presented at the Project STaR Session at the 17<sup>th</sup> Annual Association of Mathematics Teacher Educators Conference, Orlando, FL.
- Wawro, M. (2012, November). *Student reasoning about the Invertible Matrix Theorem in linear algebra*. Poster presented at the Thirty-fourth Annual Conference of the North American Chapter of the International Group for the Psychology of Mathematics Education (PME-NA), Kalamazoo, MI.
- Wawro, M. (2012, July). *Student thinking about the Invertible Matrix Theorem in linear algebra*. Paper presented at the 12th International Congress on Mathematics Education [roundtable discussion within the Learning and Cognition in Mathematics Topic Study Group], Seoul, South Korea.
- Rasmussen, C., & Wawro, M. (2012, July). *Documenting the collective activity of the mathematics classroom*. Paper presented at the 12th International Congress on Mathematics Education [Learning and Cognition in Mathematics Topic Study Group], Seoul, South Korea.
- Wawro, M. (2012, June). *Reasoning about existence and uniqueness of solutions to  $Ax=0$  and  $Ax=b$  in linear algebra: Abraham and the IMT*. Poster presented at the Second Conference on Transforming Research on Undergraduate STEM Education, St. Paul, MN.
- Rasmussen, C., Wawro, M., & Zandieh, M. (2012, April). *Four lenses for examining individual and collective level mathematical progress*. Paper presented at the American Educational Research Association (AERA) Annual Meeting [symposium on Connecting the Moving Dots: Comparing Approaches to Coordinating Temporal Analyses of Groups and Individuals], Vancouver, BC.



- Wawro, M. (2012, February). *Expanding Toulmin's Model: The development of four expanded argumentation schemes from analysis in linear algebra*. Paper presented at the Fifteenth Conference on Research in Undergraduate Mathematics Education, Portland, OR.
- Wawro, M., Larson, C., Zandieh, M., & Rasmussen, C. (2012, February). *A hypothetical learning trajectory for conceptualizing matrices as linear transformations*. Paper presented at the Fifteenth Conference on Research in Undergraduate Mathematics Education, Portland, OR.
- Wawro, M., & Larson, C. (2012, January). *A hypothetical learning trajectory for conceptualizing matrices as linear transformations*. Paper presented at the Joint Mathematics Meetings of the Mathematical Association of America and the American Mathematical Society [MAA Session on Innovative and Effective Teaching of Linear Algebra], Boston, MA.
- Wawro, M. (2011, February). *Individual and collective analysis of the genesis of student reasoning regarding the Invertible Matrix Theorem in linear algebra*. Paper presented at the 14<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, Portland, OR.
- Wawro, M., Zandieh, M., Sweeney, G., Larson, C., & Rasmussen, C. (2011, February). *Using the emergent model heuristic to describe the evolution of student reasoning regarding span and linear independence*. Paper presented at the 14<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, Portland, OR.
- Sweeney, G., & Wawro, M. (2011, January). *Revoicing as a tool for promoting effective student discourse*. Roundtable paper presented at the Fifteenth Annual Association of Mathematics Teacher Educators Conference, Irvine, CA.
- Wawro, M. (2011a, January). *A student-centered approach to span and linear independence: The case of the magic carpet ride problem*. Paper presented at the Joint Mathematics Meetings of the Mathematical Association of America and the American Mathematical Society [MAA Session on Innovative and Effective Teaching of Linear Algebra], New Orleans, LA.
- Wawro, M. (2011b, January). *Development of student reasoning regarding the Invertible Matrix Theorem in linear algebra*. Paper presented at Joint Mathematics Meetings of the Mathematical Association of America and the American Mathematical Society [SIGMAA on RUME Session on Research on the Teaching and Learning of Undergraduate Mathematics], New Orleans, LA.
- Wawro, M. (2010, October). *Individual and collective analyses of the genesis of student reasoning regarding the Invertible Matrix Theorem*. Poster presented at the Thirty-second Annual Conference of the North American Chapter of the International Group for the Psychology of Mathematics Education (PME-NA), Columbus, OH.
- Rasmussen, C., Zandieh, M., & Wawro, M. (2010, October). *Brokering as a mechanism for the social production of meaning*. Brief research report presented at the Thirty-second Annual Conference of the North American Chapter of the International Group for the Psychology of Mathematics Education (PME-NA), Columbus, OH.
- Rasmussen, C., Zandieh, M., & Wawro, M. (2010, June). *Brokering as a mechanism for the social production of meaning*. Symposium on social construction of mathematical meaning through collaboration and argumentation. Paper presented at the Ninth International Conference of the Learning Sciences, Chicago, IL.
- Cole, R., Towns, M., Rasmussen, C., Becker, N., Wawro, M., & Sweeney, G. (2010, February). *Adapting a methodology for documenting collective growth to an undergraduate physical*

*chemistry class*. Paper presented at the Thirteenth Conference on Research in Undergraduate Mathematics Education, Raleigh, NC.

Henderson, F., Rasmussen, C., Sweeney, G., Wawro, M., & Zandieh, M. (2010, February). *Symbol sense in linear algebra*. Paper presented at the Thirteenth Conference on Research in Undergraduate Mathematics Education, Raleigh, NC.

Wawro, M., Sweeney, G., & Rabin, J. M. (2010, February). *Subspace in linear algebra: Investigating students' concept images and interactions with the formal definition*. Paper presented at the Thirteenth Conference on Research in Undergraduate Mathematics Education, Raleigh, NC.

Wawro, M. (2009, February). *Task design: Towards promoting a geometric conceptualization of linear transformation and change of basis*. Paper presented at the Twelfth Conference on Research in Undergraduate Mathematics Education, Raleigh, NC.

Rasmussen, C., Zandieh, M., & Wawro, M. (2009, February). *The social production of meaning*. Paper presented at the Twelfth Conference on Research in Undergraduate Mathematics Education, Raleigh, NC.

## **AWARDS, PRIZES, AND RECOGNITIONS**

Affiliate Faculty, Virginia Tech School of Education Faculty of Teaching and Learning, 2014-present

Best Paper Award for the Sixteenth Annual Conference on Research in Undergraduate Mathematics Education (RUME) with David Plaxco, 2013.

STaR (Service, Teaching, and Research) Fellow, 2012. The STaR Project is an NSF-funded networking and mentoring program for new faculty in math education.

## **GRADUATE STUDENT SUPERVISION**

- Doctoral dissertation advisor for David Plaxco; defended August 2015. Dissertation Title: *Relating Understanding of Inverse and Identity to Engagement in Proof in Abstract Algebra*
- Doctoral dissertation advisor for George Kuster; defended June 2016. Dissertation Title: *On the Role of Student Understanding of Function and Rate of Change in Learning Differential Equations*
- Master's and PhD advisor for Kevin Watson
- Master's presentation advisor for Neal Aronson
- Doctoral committee member for Steven Boyce and Cong ze Xu

## **REVIEWER FOR PROFESSIONAL JOURNALS**

- Journal for Research in Mathematics Education
- Educational Studies in Mathematics
- International Journal of Research in Undergraduate Mathematics Education
- Journal of Mathematical Behavior
- Mathematics Education Research Journal
- Canadian Journal for Science, Mathematics, and Technology Education
- Problems, Resources, and Issues in Mathematics Undergraduate Studies (PRIMUS)

## **REVIEWER FOR PROFESSIONAL CONFERENCES**

- International Group for the Psychology of Mathematics Education, North American Chapter Annual Conference (PME-NA)
- Special Interest Group of the Mathematical Association of America on Research in Undergraduate Mathematics Education (RUME)
- Congress for European Research in Mathematics Education (CERME)

## **MEMBERSHIPS IN PROFESSIONAL SOCIETIES**

- Association for Women in Mathematics (AWM)
- European Society for Research in Mathematics Education (ERME)
- Mathematical Association of America (MAA) and Special Interest Group of the MAA on Research in Undergraduate Mathematics Education (SIGMAA on RUME)
- National Council of Teachers of Mathematics (NCTM)
- International Group for the Psychology of Mathematics Education (PME)
- Virginia Council of Teachers of Mathematics (VCTM)

## **SERVICE TO THE RESEARCH COMMUNITY**

- Editorial Board member for the International Journal for Research in Undergraduate Mathematics Education, 2016-present
- Elected member of the Executive Committee (Program Chair) for the SIGMAA on RUME, 2016-2018
- Member of the Planning Committee for the Annual Conference on Research in Undergraduate Mathematics Education, 2012-present
- Lead developer for the NSF-funded (DUE-1245673, 1245796, and 1246083) Inquiry-Oriented Linear Algebra (IOLA) curriculum materials. Materials maintained and available to interested university instructors at <http://iola.math.vt.edu>
- Curriculum Advisory Board member for the research project, National Science Foundation Innovations in Undergraduate STEM Education, Collaborative Research: Teaching Inquiry-Oriented Mathematics: Establishing Supports (#143195, 1431641, 1431393), E. Johnson (PI); K. Keene, C. Andrews-Larson (co-PIs), \$999,773, 2014-17
- Executive Committee member for the research project, National Science Foundation, Transforming Research in Undergraduate STEM Education (DUE #151038); W. Christensen (PI), C. Rasmussen, J. Thompson, M. Towns, (co-PIs), \$49,994, 2015.
- Co-organizer (with David Strong, Pepperdine University, and Gil Strang, MIT) of the MAA Session on Innovative and Effective Ways to Teach Linear Algebra, Joint Mathematics Meetings, 2014-present
- Co-organizer (with Warren Christensen, North Dakota State University) of the Math-Physics Working Group, Annual Conference on Research in Undergraduate Mathematics Education (RUME), 2013, 2015
- Panel reviewer for EHR Directorate at the National Science Foundation, 2015, 2016.
- Graduate Student Panelist for the Southern California Undergraduate Mathematics Conference, organized by University of California San Diego's chapter of the Association for Women in Mathematics (AWM), 2010
- Local organizing committee member for the Fifth Biennial National Conference of Cognitively Guided Instruction (CGI), San Diego, CA, 2009
- Local organizing committee member for the Eleventh Annual Conference of the Special Interest Group of the Mathematical Association of America on Research in Undergraduate Mathematics Education, San Diego, CA, 2008

## **COURSES TAUGHT AT VIRGINIA TECH**

- MATH 1114H Elementary Linear Algebra for Honors
- MATH 2114 Introduction to Linear Algebra
- MATH 3144 Linear Algebra I
- MATH 4625 Mathematics for Secondary Teachers
- MATH 4626 Mathematics for Secondary Teachers
- MATH 4664 Senior Mathematics Education Seminar
- MATH 5634 Research in Undergraduate Mathematics Education

## **SERVICE TO THE UNIVERSITY**

- Mathematics Department Undergraduate Program Committee, 2013-2016
- Mathematics Education Program Committee, 2011-present
- Mathematics Department Scholarship Committee, 2012-2014
- MATH 2114 Course Co-Coordinator, 2014
- Mathematics Department tenure-track Mathematics Education search committee member, 2012-2013
- Mathematics Department Patricia A. Caldwell Postdoctoral Researcher search committee member, 2016-2017
- College of Science tenure-track Integrated Science search committee member, 2012-2013
- Panelist in the New Faculty Mentoring Program, sponsored by the Office of the Provost, 2012 & 2014
- Led the development of the course, *MATH 5634 Research in Undergraduate Mathematics Education*, first offered Spring 2012 and made permanent in 2013
- Worked with department colleagues to develop the course, *MATH 2114 Introduction to Linear Algebra*, first offered and made permanent in Fall 2014. Served as course co-coordinator, 2014-2015