

## MEGAN WAWRO

Professor  
Department of Mathematics, Virginia Tech  
Mathematics (MC 0123), McBryde Hall 438  
Virginia Tech, 225 Stanger St.  
Blacksburg, VA 24061-1026

Phone: (540) 231-4937  
Fax: (540) 231-5960  
mwawro@vt.edu  
<https://math.vt.edu/people/faculty/wawro-megan>

### EDUCATION

University of California, San Diego & San Diego State University	2007-2011	Ph.D.	Mathematics and Science Education
Miami University	2003-2005	M.A.	Mathematics
Cedarville University	1996-2000	B.A.	Mathematics

### EMPLOYMENT

2023 - present	Professor, Department of Mathematics, Virginia Tech, Blacksburg, VA
2016 - 2023	Associate Professor, Department of Mathematics, Virginia Tech, Blacksburg, VA
2011 - 2016	Assistant Professor, Department of Mathematics, Virginia Tech, Blacksburg, VA
2007 - 2011	Graduate Research Assistant, Department of Mathematics and Statistics, San Diego State University, San Diego, CA
2005 - 2007	Visiting Instructor, Department of Mathematics and Statistics, Miami University, Oxford, OH
2005 - 2007	Summer in Switzerland program Mathematics Teacher and Residential Life Coordinator ('07), Leysin American School, Leysin, Switzerland
2003 - 2005	Graduate Teaching Assistant, Department of Mathematics and Statistics, Miami University, Oxford, OH
2001 - 2003	Mathematics Teacher, Institut auf dem Rosenberg, St. Gallen, Switzerland
2000 - 2001	Art Teacher and Mathematics Teacher, Portsmouth East High School, Portsmouth, OH

### AWARDS AND RECOGNITIONS

*Presidential Early Career Award for Scientists and Engineers (PECASE)* recipient, 2019  
*National Science Foundation CAREER Award* through Division of Undergraduate Education (DUE), 2015-22  
*Affiliate Faculty*, Virginia Tech School of Education Faculty of Teaching and Learning, 2014-present  
*Virginia Tech Thank-a-Teacher* note recipient, 2022, 2023  
*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*, a mentoring program for new math education faculty, 2012

### PUBLICATIONS

#### Refereed journal articles

Wawro, M., & Serbin, K. S. (accepted). "What makes it eigen-esque-ish?": A form-function analysis of the development of eigentheory concepts in a quantum mechanics course. *Educational Studies in Mathematics*.

- Serbin, K. S., & Wawro, M. (2024). Pedagogical moves related to analogy that support a unified understanding of eigentheory concepts in a quantum mechanics class. *Physical Review Physics Education Research*, 20(2), 020137. <https://doi.org/10.1103/PhysRevPhysEducRes.20.020137>
- Wawro, M., Pina, A., Thompson, J. R., Topdemir, Z., & Watson, K. (2024). Student interpretations of eigenequations in linear algebra and quantum mechanics. *International Journal of Research in Undergraduate Mathematics Education*. <https://doi.org/10.1007/s40753-024-00241-7>
- Rasmussen, C., Wawro, M., & Zandieh, M. (2024). Integrated methodological approach for documenting individual and collective mathematical progress: Reinventing the Euler method algorithmic tool. *Education Sciences*, 14(3), 335. <https://doi.org/10.3390/educsci14030335>
- Mauntel, M., Wawro, M., & Plaxco, D. (2024). An inquiry-oriented approach to determinants. *PRIMUS*. <https://doi.org/10.1080/10511970.2024.2315134>
- Serbin, K.S., & Wawro, M. (2024). The inextricability of students' mathematical and physical reasoning in quantum mechanics problems. *International Journal of Research in Undergraduate Mathematics Education*, 10, 57-86. <https://doi.org/10.1007/s40753-022-00174-z>
- Serbin, K.S., Wawro, M., & Storms, R. (2021). Characterizations of student, instructor, and textbook discourse related to basis and change of basis in quantum mechanics. *Physical Review Physics Education Research*, 17, 010140. <https://doi.org/10.1103/PhysRevPhysEducRes.17.010140>
- Robinson, A., Simonetti, J.H., Richardson, K.L., & Wawro, M. (2021). Positive attitudinal shifts and a narrowing gender gap: Do expertlike attitudes correlate to higher learning gains for women in the physics classroom? *Physical Review Physics Education Research*, 17, 010101. <https://doi.org/10.1103/PhysRevPhysEducRes.17.010101>
- Serbin, K.S., Sanchez-Robayo, B.J., Truman, J., Watson, K., & Wawro, M. (2020). Characterizing quantum physics students' conceptual and procedural knowledge of the characteristic equation. *Journal of Mathematical Behavior*, 58, 100777. <https://doi.org/10.1016/j.jmathb.2020.100777>
- Wawro, M., Watson, K., & Christensen, W. (2020). Students' metarepresentational competence with matrix notation and Dirac notation in quantum mechanics. *Physical Review Physics Education Research*, 16, 020112. <https://doi.org/10.1103/PhysRevPhysEducRes.16.020112>
- Wawro, M., Watson, K., & Zandieh, M. (2019). Student understanding of linear combinations of eigenvectors. *ZDM The International Journal on Mathematics Education*, 51(7), 1111-1123. <https://doi.org/10.1007/s11858-018-01022-8>
- 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*, 48(6), 809-829. <https://doi.org/10.1080/0020739X.2016.1276225>
- Zandieh, M., Wawro, M., & Rasmussen, C. (2017). An example of inquiry in linear algebra: The roles of symbolizing and brokering. *PRIMUS*, 27(1), 96-124. <https://doi.org/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. <https://doi.org/10.1007/s40753-015-0017-7>
- Plaxco, D., & Wawro, M. (2015). Analyzing student understanding in linear algebra through mathematical activity. *Journal of Mathematical Behavior*, 38, 87-100. <https://doi.org/10.1016/j.jmathb.2015.03.002>
- Rasmussen, C., Wawro, M., & Zandieh, M. (2015). Examining individual and collective level mathematical progress. *Educational Studies in Mathematics*, 88(2), 259-281. <https://doi.org/10.1007/s10649-014-9583-x>
- 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. <https://doi.org/10.5951/jresmetheduc.45.5.0550>

- Wawro, M. (2014). Student reasoning about the invertible matrix theorem in linear algebra. *ZDM The International Journal on Mathematics Education*, 46(3), 1-18. <https://doi.org/10.1007/s11858-014-0579-x>
- 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*, 22(8), 577-599. <https://doi.org/10.1080/10511970.2012.667516>
- 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. <https://doi.org/10.1039/C2RP20085F>
- 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(1), 193-211. <https://doi.org/10.1007/s10763-011-9284-1>
- 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. <https://doi.org/10.1080/10508406.2011.611445>
- 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. <https://doi.org/10.1007/s10649-011-9307-4>

### Other publications (refereed expository pieces and book reviews)

- Boman, E., Axler, S., Beezer, R. A., Catral, M., McDonald, J., Stewart, S., Strong, D., Vega, O., & Wawro, M. (2023). Linear algebra course area report. *Committee on the Undergraduate Program in Mathematics (CUPM) Curriculum Guide*. <https://maa.org/programs/faculty-and-departments/curriculum-department-guidelines-recommendations/cupm/2015-cupm-curriculum-guide>
- Stewart, S., Axler, S., Beezer, R., Boman, E., Catral, M., Harel, G., McDonald, J., Strong, D., & Wawro, M. (2022). The Linear Algebra Curriculum Study Group (LACSG 2.0) recommendations. *Notices of the American Mathematical Society*, 69(5), 813-820. <https://www.ams.org/notices/202205>
- Wawro, M. (2019). Book review: Proceedings of INDRUM 2018, second conference of the international network for didactic research in university mathematics. *International Journal of Research in Undergraduate Mathematics Education*, 5(3), 424-429. <https://doi.org/10.1007/s40753-019-00103-7>
- Trigueros, M., & Wawro, M. (2019). Linear Algebra Teaching and Learning. In S. Lerman (Ed.), *Encyclopedia of Mathematics Education*. Springer. [https://doi.org/10.1007/978-3-319-77487-9\\_100021-1](https://doi.org/10.1007/978-3-319-77487-9_100021-1)
- 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.

### Refereed book chapters

- Wawro, M., Andrews-Larson, C., Zandieh, M., & Plaxco, D. (2022). Inquiry-Oriented Linear Algebra: Connecting design-based research and instructional change theory in curriculum design. In R. Biehler, M. Liebendörfer, G. Gueudet, C. Rasmussen, & C. Winsløw (Eds.), *Practice-Oriented Research in Tertiary Mathematics Education: New Directions* (pp. 329-348), Springer. [https://doi.org/10.1007/978-3-031-14175-1\\_16](https://doi.org/10.1007/978-3-031-14175-1_16)
- Plaxco, D., & Wawro, M. (2022). Argumentation in the context of tertiary mathematics: A case study of classroom argumentation and the role of instructor moves. In K. Bieda, A.M. Connor, C. Kosko, & M. Staples (Eds.), *Conceptions and Consequences of Argumentation, Justification, and Proof* (pp. 219-237), Springer. <https://doi.org/10.1007/978-3-030-80008-6>
- Winsløw, C., Biehler, R., Jaworski, B., Rønning, F., & Wawro, M. (2021). Education and professional

development of university mathematics teachers. In V. Durand-Guerrier, R. Hochmuth, E. Nardi, & C. Winsløw (Eds.), *Research and Development in University Mathematics Education: Overview produced by the International Network for Research on Didactics of University Mathematics* (pp. 59-79), Routledge. <https://doi.org/10.4324/9780429346859-6>

Plaxco, D., Zandieh, M., & Wawro, M. (2018). Stretch directions and stretch factors: A sequence intended to support guided reinvention of eigenvector and eigenvalue. In S. Stewart, C. Andrews-Larson, A. Berman, & M. Zandieh (Eds.), *Challenges in Teaching Linear Algebra* (pp. 175-192), ICME-13 Monographs. Springer, Cham. [https://doi.org/10.1007/978-3-319-66811-6\\_8](https://doi.org/10.1007/978-3-319-66811-6_8)

Rasmussen, C., & Wawro, M. (2017). Post-calculus research in undergraduate mathematics education. In J. Cai, (Ed.), *The compendium for research in mathematics education* (pp. 551-579). NCTM.

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. [https://doi.org/10.1007/978-3-319-44950-0\\_10](https://doi.org/10.1007/978-3-319-44950-0_10)

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). 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). Information Age Publishing.

### Refereed conference papers

Wawro, M. & Serbin, K. S. (2024). Form-function relations for eigentheory in quantum mechanics. In A. S. González-Martín, G. Gueudet, I. Florensa, & N. Lombard (Eds.), *Proceedings of the 5th Conference of the International Network for Didactic Research in University Mathematics* (p. 350-359). Escola Univeristària Salesiana de Sarrià – Univ. Autònoma de Barcelona and INDRUM.

Fleischmann, Y., & Wawro, M. (2024). TWG 2: Teaching and learning of linear and abstract algebra. In A. S. González-Martín, G. Gueudet, I. Florensa, & N. Lombard (Eds.), *Proceedings of the 5th Conference of the International Network for Didactic Research in University Mathematics* (p. 235-239). Escola Univeristària Salesiana de Sarrià – Univ. Autònoma de Barcelona and INDRUM.

Wawro, M., Mauntel, M., & Plaxco, D. (2023). Student reasoning about determinants with GeoGebra. In P. Drijvers, C. Csapodi, H. Palmér, K. Gosztanyi, & E. Kónya (Eds.), *Proceedings of the Thirteenth Congress of European Research Society in Mathematics Education* (pp. 2567-2568). Alfréd Rényi Institute of Mathematics; ERME.

Biza, I., Viirman, O., Bašić, M., Florensa, I., Gueudet, G., Hitier, M., Kontorovich, I., Thoma, A., & Wawro, M. (2023). An introduction to TWG14: University mathematics education. In P. Drijvers, C. Csapodi, H. Palmér, C. Gosztanyi, & E. Kónya (Eds.), *Proceedings of the Thirteenth Congress of European Research Society in Mathematics Education* (pp. 2243-2250). Alfréd Rényi Institute of Mathematics; ERME.

Wawro, M., Mauntel, M., & Plaxco, D. (2023). “The shape will have no volume”: Relationships students observed about determinants in a dynamic geometric applet. In S. Cook, B. Katz, and D. Moore-Russo (Eds.), *Proceedings of the 25<sup>th</sup> annual conference on research in undergraduate mathematics education* (p. 403-411). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.

Wawro, M., Park, M., Zandieh, M., Bettersworth, Z., & Lee, I. (2023). Student reasoning about the least-squares problem in inquiry-oriented linear algebra. In S. Cook, B. Katz, and D. Moore-Russo (Eds.), *Proceedings of the 25<sup>th</sup> annual conference on research in undergraduate mathematics education* (p. 643-651). The Special Interest Group of the Mathematical Association of America for Research in

## Undergraduate Mathematics Education.

- Wawro, M., & Serbin, K. (2023). "What makes it eigen-esque-ish?": Eigentheory development in a quantum mechanics course. In S. Cook, B. Katz, and D. Moore-Russo (Eds.), *Proceedings of the 25<sup>th</sup> annual conference on research in undergraduate mathematics education* (p. 991-998). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Schermerhorn, B. P., & Wawro, M. (2022). Students' conceptual understanding of normalization of vectors from  $\mathbb{R}^2$  and  $\mathbb{C}^2$ . In S. S. Karunakaran & A. Higgins (Eds.), *Proceedings of the 24<sup>th</sup> conference on research in undergraduate mathematics education* (pp. 546-553). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Serbin, K. S., & Wawro, M. (2022). Ways that student reasoning about linear algebra concepts can support flexibility in solving quantum mechanics problems. In S. S. Karunakaran & A. Higgins (Eds.), *Proceedings of the 24<sup>th</sup> conference on research in undergraduate mathematics education* (pp. 554-562). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Lee, I., Betterworth, Z., Zandieh, M., Wawro, M., & Quinlan, I. (2022). Student thinking in an inquiry-oriented approach to teaching least squares. In S. S. Karunakaran & A. Higgins (Eds.), *Proceedings of the 24<sup>th</sup> conference on research in undergraduate mathematics education* (pp. 349-356). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Rasmussen, C., Wawro, M., & Zandieh, M. (2022). Student reinvention of Euler's method: An integrated analysis of one small group's individual and collective mathematical progress. In J. Hodgen, E. Geraniou, G. Bolondi & F. Ferretti (Eds.), *Proceedings of the Twelfth Congress of European Research Society in Mathematics Education (CERME12)* (pp.1-9). Free University of Bozen-Bolzano and ERME.
- Serbin, K. S. & Wawro, M. (2021). Students' understanding of linear algebra concepts underlying a procedure in a quantum mechanics task. In A.I. Sacristán, J.C. Cortés-Zavala, & P.M. Ruiz-Arias (Eds.), *Mathematics education across cultures: Proceedings of the 42nd meeting of the North American chapter of the international group for the psychology of mathematics education* (pp. 1218-1222). Cinvestav / AMIUTEM / PME-NA. <https://doi.org/10.51272/pmema.42.2020>
- Wawro, M., Thompson, J., & Watson, K. (2020). Student meanings for eigenequations in mathematics and in quantum mechanics. In S.S. Karunakaran, Z. Reed, & A. Higgins (Eds.), *Proceedings of the 23rd annual conference on research in undergraduate mathematics education* (pp. 629-636). The Special Interest Group of the MAA for Research in Undergraduate Mathematics Education.
- Serbin, K.S., Storms, R., & Wawro, M. (2020). Students' language about basis and change of basis in a quantum mechanics problem. In S.S. Karunakaran, Z. Reed, & A. Higgins (Eds.), *Proceedings of the 23rd annual conference on research in undergraduate mathematics education* (pp. 520-528). The Special Interest Group of the MAA for Research in Undergraduate Mathematics Education.
- Wawro, M., Watson, K., & Christensen, W. (2019). Student reasoning about eigenvectors and eigenvalues from a Resources perspective. In A. Weinberg, D. Moore-Russo, H. Soto, & M. Wawro (Eds.), *Proceedings of the 22<sup>nd</sup> annual conference on research in undergraduate mathematics education* (pp. 654-662). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Serbin, K., Sanchez-Robayo, B., Watson, K., Truman, J., Jiang, S., & Wawro, M. (2019). Characterizing conceptual and procedural knowledge of the characteristic equation. In A. Weinberg, D. Moore-Russo, H. Soto, & M. Wawro (Eds.), *Proceedings of the 22<sup>nd</sup> annual conference on research in undergraduate mathematics education* (pp. 541-548). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Wawro, M., Zandieh, M., & Watson, K. (2018). Delineating aspects of understanding eigentheory through

- assessment development. In V. Durand-Guerrier, R. Hochmuth, S. Goodchild, & N.M. Hogstad (Eds.), *Proceedings of the 2<sup>nd</sup> conference of the international network for didactic research in university mathematics (INDRUM, 5-7 April 2018)* (pp. 275-284). University of Agder and INDRUM.
- Wawro, M., Watson, K., & Christensen, W. (2017). Meta-representational competence with linear algebra in quantum mechanics. In A. Weinberg, C. Rasmussen, J. Rabin, M. Wawro, & S. Brown (Eds.), *Proceedings of the 20<sup>th</sup> annual conference on research in undergraduate mathematics education* (pp. 326-337). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Watson, K., Wawro, M., Zandieh, M., & Kerrigan, S. (2017). Knowledge about student understanding of eigentheory: Information gained from multiple choice extended assessment. In A. Weinberg, C. Rasmussen, J. Rabin, M. Wawro, & S. Brown (Eds.), *Proceedings of the 20<sup>th</sup> annual conference on research in undergraduate mathematics education* (pp. 311-325). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Wawro, M., Watson, K., & Christensen, W. (2017). 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. In T. Dooley & G. Gueudet (Eds.), *Proceedings of the 10<sup>th</sup> congress of the European society for research in mathematics education* (pp. 2282-2289). DCU Institute of Education and ERME.
- Zandieh, M., Wawro, M., & Rasmussen, C. (2016). Symbolizing and brokering in an inquiry-oriented linear algebra classroom. In T. Fukawa-Connelly, N. Infante, M. Wawro, & S. Brown (Eds.), *Proceedings of the 19th annual conference on research in undergraduate mathematics education* (1475-1483). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Jaworski, B., Potari, D., Rasmussen, C., Oates, G., Kwon, O.N., Ellis, J., ... Zachariades, T. (2016). Mathematics learning and teaching at university level. In C. Csikos, A. Rausch, & J. Sztányi (Eds.), *Proceedings of the 40th Conference of the International Group for the Psychology of Mathematics Education, Vol. 1*, pp. 375-404. PME.
- Rasmussen, C., Wawro, M., & Zandieh, M. (2015). Examining individual and collective level mathematical progress. In T. Fukawa-Connelly, N. Infante, K. Keene, & M. Zandieh (Eds.), *Proceedings of the 18th annual conference on research in undergraduate mathematics education* (896-903). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Zandieh, M., Plaxco, D., Wawro, M., Rasmussen, C., Milbourne, H., & Czeranko, K. (2015). Extending multiple choice format to document student thinking. In T. Fukawa-Connelly, N. Infante, K. Keene, & M. Zandieh (Eds.), *Proceedings of the 18th annual conference on research in undergraduate mathematics education* (pp. 1079-1085). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- 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 9<sup>th</sup> congress of the European society for research in mathematics education (CERME9, 4-8 February 2015)* (pp. 2297-2298). Charles University in Prague, Faculty of Education and ERME.
- Plaxco, D., Wawro, M., & Zietsman, L. (2014). Student understanding of linear independence of functions. In T. Fukawa-Connelly, G. Karakok, K. Keene, & M. Zandieh (Eds.), *Proceedings of the 17th annual conference on research in undergraduate mathematics education* (pp. 992-998). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Larson, C., Wawro, M., Zandieh, M., Rasmussen, C., Plaxco, D., & Czeranko, K. (2014). *Implementing*



- inquiry-oriented instructional materials in undergraduate mathematics*. In T. Fukawa-Connelly, G. Karakok, K. Keene, & M. Zandieh (Eds.), *Proceedings of the 17th annual conference on research in undergraduate mathematics education* (pp. 797-802). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- 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, & M. Oehrtman (Eds.), *Proceedings of the 16th annual conference on research in undergraduate mathematics education* (pp. 1-15). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Wawro, M. (2012). Expanding Toulmin's Model: The development of four expanded argumentation schemes from analysis in linear algebra. In S. Brown, S. Larsen, K. Marrongelle, & M. Oehrtman (Eds.), *Proceedings of the 15th annual conference on research in undergraduate mathematics education* (pp. 2-242 – 2-250). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- 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, & M. Oehrtman (Eds.), *Proceedings of the 15th annual conference on research in undergraduate mathematics education* (pp. 1-465 – 1-479). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Wawro, M. (2011). Individual and collective analysis of the genesis of student reasoning regarding the Invertible Matrix Theorem in linear algebra. In S. Brown, S. Larsen, K. Marrongelle, & M. Oehrtman (Eds.), *Proceedings of the 14th annual conference on research in undergraduate mathematics education* (pp. 3-179 – 3-184). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Wawro, M., Zandieh, M., Sweeney, G., Larson, C., & Rasmussen, C. (2011). Using the emergent model heuristic to describe the evolution of student reasoning regarding span and linear independence. In S. Brown, S. Larsen, K. Marrongelle, & M. Oehrtman (Eds.), *Proceedings of the 14th annual conference on research in undergraduate mathematics education* (pp. 3-185 – 3-189). The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- 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 32<sup>nd</sup> annual meeting of the North American chapter of the international group for the psychology of mathematics education* (pp. 1577-1587). 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 32<sup>nd</sup> annual meeting of the North American chapter of the international group for the psychology of mathematics education* (pp. 427-434). 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 9<sup>th</sup> 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.
- 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*. The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education. Retrieved from: <http://sigmaa.maa.org/rume/crume2010/Abstracts2010.htm>

- 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*. The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education. Retrieved from: <http://sigmaa.maa.org/rume/crume2010/Abstracts2010.htm>
- 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*. The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education. Retrieved from: <http://sigmaa.maa.org/rume/crume2010/Abstracts2010.htm>
- 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*. The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education. Retrieved from: <http://sigmaa.maa.org/rume/crume2009/proceedings.html>

### **Editor for Conference Proceedings**

- Weinberg, A., Moore-Russo, D., Soto, H., Wawro, M. (Eds.). (2019). *Proceedings of the 22<sup>nd</sup> annual conference on research in undergraduate mathematics education*. The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Weinberg, A., Rasmussen, C., Rabin, J., Wawro, M., & Brown, S. (Eds.). (2018). *Proceedings of the 21<sup>st</sup> annual conference on research in undergraduate mathematics education*. The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- Weinberg, A., Rasmussen, C., Rabin, J., Wawro, M., & Brown, S. (Eds.). (2017). *Proceedings of the 20<sup>th</sup> annual conference on research in undergraduate mathematics education*. The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.
- 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*. The Special Interest Group of the Mathematical Association of America for Research in Undergraduate Mathematics Education.

### **Dissertation**

- Wawro, M. J. (2011). *Individual and collective analyses of the genesis of student reasoning regarding the Invertible Matrix Theorem in linear algebra* (Doctoral dissertation, UC San Diego).

### **GRANTS**

- National Science Foundation Improving Undergraduate STEM Education, *Collaborative Research: Extending Inquiry-Oriented Linear Algebra* (DUE- 1915156, 1914841, 1914793), M. Wawro (lead PI), M. Zandieh and C. Andrews-Larson (PIs), D. Plaxco (co-PI), 2019-2023, Total award \$618,430.
- 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), 2016-2020, \$199,992. Serving as PI (DUE-1938495) for 2019-2022, \$77,437.
- 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. Pleimling, A. Robinson (co-PIs), J. Simonetti, M. Wawro (senior personnel), 2015-2017, \$296,996.
- 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), 2015-2022, \$779,686.



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 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 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), 2013-2019, \$800,000.

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 (lead PI), M. Zandieh and C. Rasmussen (PIs), 2013-2017, Total award \$179,949.

National Science Foundation Robert Noyce Teach Scholarship, *Virginia Teach: Serving Mathematics Students in Need* (DUE-0832992), A. Norton (PI), J. Wilkins, B. Kreye, M. Wawro, C. Ulrich (co-PIs), 2008-2015, \$890,307

Virginia Tech Office of the Provost, Faculty Writing Group Grant: *WRITE (Writers Researching, Innovating, and Teaching Each other)*, A. Reed (convener), K. Carmichael, T. Drape, E. Johnson, C. Labuski, S. Ovink, C. Robbins, S. Tomer, & M. Wawro, 2022-2023, \$2000.

Virginia Tech Office of the Provost, Faculty Writing Group Grant: *WRITE (Writers Researching, Innovating, and Teaching Each other)*, E. Meitner (convener), S. Adams, K. Carmichael, C. Catalano, T. Drape, E. Johnson, C. Labuski, T. Lane, S. Ovink, A. Reed, C. Robbins, S. Tomer, & M. Wawro, 2020-2022, \$2000.

Virginia Tech Office of the Provost, Faculty Writing Group Grant: *WRITE (Women Researching, Innovating, and Teaching Each other)*, M. Wawro (convener), Carmichael, K., Drape, T., Johnson, E. Labuski, C., Meitner, E., Ovink, S., Reed, A., Robbins, C. K., & Tomer, S., 2019-2020, \$2000.

Virginia Tech Office of the Provost, Faculty Writing Group Grant: *WRITE (Women Researching, Innovating, and Teaching Each other)*, S. Ovink (convener), Carmichael, K., Drape, T., Johnson, E. Labuski, C., Meitner, E., Reed, A., Robbins, C. K., Tomer, S., & Wawro, M., 2018-2019, \$2000.

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: \$1,700: 2018 (Norway), 2017 (Ireland), 2016 (France).

Virginia Tech International Travel Supplement Grant: \$2,000, 2015 (Czech Republic), 2012 (South Korea).

Association for Women in Mathematics (AWM), AWM-NSF Travel Grant, 2013, \$1500.

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

## INVITED TALKS

Wawro, M. (2024, August). *Research on the learning and teaching of linear algebra*. Invited colloquium given in the Virginia Tech Mathematics Department, Blacksburg, VA.

Wawro, M. (2023, October). *The Inquiry-Oriented Linear Algebra Project*. Invited colloquium given in the Colorado School of Mines Department of Applied Mathematics & Statistics. [virtual]

Wawro, M. (2023, January). *Student reasoning about linear algebra in quantum mechanics*. Invited talk for the Workshop on Quantum Education for Quantum Workforce Development, Arlington, VA.

Wawro, M. (2022, September). *The Inquiry-Oriented Linear Algebra Project*. Invited speaker for the Online Seminar on Undergraduate Mathematics Education (OLSUME). [virtual]

Wawro, M. (2022, April). *Student understanding of linear combinations of eigenvectors*. Invited colloquium

given at Colorado State University, Fort Collins, CO.

- Axler, S., Boman, E., Catral., M., Harel, G., McDonald, J., Stewart, S., Strong, D., & Wawro, M. (2021, May). *Linear Algebra Curriculum Study Group (LACSG 2.0) recommendations*. Invited panelist for “Transforming Learning and Teaching: Precalculus, Calculus, and Linear Algebra,” MAA Virtual Programs. [virtual]
- Wawro, M. (2021, April). *Inquiry-Oriented Linear*. Invited speaker in the Seoul National University Center for Research in Mathematics Education Webinar Series, Seoul, South Korea. [virtual]
- Wawro, M. (2021, April). *Student understanding of linear combinations of eigenvectors*. Invited speaker in the Seoul National University Center for Research in Mathematics Education Webinar Series, Seoul, South Korea. [virtual]
- Wawro, M. (2021, April). *Inquiry-Oriented Linear Algebra*. Invited presentation given at the Cornell University Department of Mathematics Teaching Seminar, Ithaca, NY. [virtual]
- Wawro, M. (2019, September). *Student reasoning about linear algebra in quantum physics*. Invited colloquium given at Montana State University, Bozeman, MT.
- Wawro, M. (2019, March). *Exploring teaching and learning through Inquiry-Oriented Linear Algebra*. Invited colloquium given at the University of Oslo, Oslo, Norway.
- Wawro, M. (2019, January). *Student reasoning about linear algebra in quantum physics*. Invited colloquium given at the University of Auckland, Auckland, New Zealand.
- Wawro, M. (2018, November). *Exploring teaching and learning through Inquiry-Oriented Linear Algebra*. Invited colloquium given at Northern Illinois University, DeKalb, IL.
- Wawro, M. (2018, November). *Student reasoning about linear algebra in quantum physics*. Invited colloquium given at Northern Illinois University, DeKalb, IL.
- Wawro, M. (2018, October). *Inquiry-Oriented Linear Algebra*. Invited workshop leader for the NSF-sponsored (DUE 1822247) Linear Algebra Workshop on National Pedagogical Initiatives in Linear Algebra, University of Oklahoma, Norman, OK.
- Wawro, M. (2018, May). *Discovering definitions in Inquiry-Oriented Linear Algebra*. Invited Facilitator for a Live Classroom Session for the Inquiry-Based Learning and Teaching Conference, Austin, TX.
- Wawro, M. (2018, April). *Education and professional development of university mathematics teachers*. Plenary panelist for the International Network for Didactic Research in University Mathematics (INDRUM), Kristiansand, Norway.
- Wawro, M. (2018, March). *Student reasoning about linear algebra in quantum physics*. Invited colloquium given at Yale University as part of the Yale STEM Center for Teaching and Learning Seminar Series, New Haven, CT.
- Wawro, M. (2018, March). *Exploring teaching and learning through Inquiry-Oriented Linear Algebra*. Invited workshop given at the University of Bridgeport as part of the Yale STEM Center for Teaching and Learning Seminar Series, Bridgeport, CT.
- Wawro, M. (2018, February). *Student reasoning about eigenvectors and eigenvalues*. Invited colloquium given at James Madison University, Harrisonburg, VA.
- Wawro, M. (2017, November). *An inquiry-oriented approach to the teaching and learning of linear algebra*. Invited keynote speaker for the *Wisconsin Section NExT Meeting*. Baraboo, WI.
- Wawro, M. (2017, July). *Student understanding and symbolization of eigentheory*. Plenary speaker for the Physics Education Research Conference, Cincinnati, OH.
- Wawro, M. (2017, July). *Student understanding at the intersection of linear algebra and quantum physics*. Plenary speaker for the Transforming Research in Undergraduate STEM Education (TRUSE) Conference,

St. Paul, MN.

- Wawro, M. (2017, February). *How to support each other in being successful*. Plenary panelist for the 2017 Mentoring and Partnerships for Women in RUME (MPWR) Conference, San Diego, CA.
- 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.
- Wawro, M. (2016, September). *Research on the learning and teaching of diagonalization and eigentheory*. 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 teaching and learning 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**

*Speakers are noted in bold.*

- Wawro, M.,** Zandieh, M., & Bettersworth, Z. (2025, February). *An inquiry-oriented approach to least squares in linear algebra*. Paper presented at the Congress on European Research in Mathematics Education (CERME), Bolzano, Italy.

- Wawro, M., & Serbin, K. S.** (2024, June). *Form-function relations for eigentheory in quantum mechanics*. Paper presented at the 5th Conference of the International Network for Didactic Research in University Mathematics (INDRUM), Barcelona, Spain.
- Wawro, M., Mauntel, M., & Plaxco, D.** (2023, July). *Student reasoning about determinants with GeoGebra*. Poster presented at the Congress for European Research in Mathematics Education, Budapest, Hungary.
- Plaxco, D., Wawro, M., & Mauntel, M.** (2023, May). *An Inquiry-Oriented Task Sequence for Teaching Determinants*. Presentation at the Third International Conference on Applications of Mathematics to Nonlinear Sciences (AMNS-2023), Pokhara, Nepal.
- Wawro, M., Mauntel, M., & Plaxco, D.** (2023, February). *“The shape will have no volume”: Relationships students observed about determinants in a dynamic geometric applet*. Paper presented at the 25<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, SIGMAA on RUME, Omaha, NE.
- Wawro, M., Park, M., Zandieh, M., Bettersworth, Z., & Lee, I.** (2023, February). *Student reasoning about the least-squares problem in inquiry-oriented linear algebra*. Paper presented at the 25<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, SIGMAA on RUME, Omaha, NE.
- Wawro, M., & Serbin, K.** (2023, February). *“What makes it eigen-esque-ish?”: Eigentheory development in a quantum mechanics course*. Paper presented at the 25<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, SIGMAA on RUME, Omaha, NE.
- Mauntel, M., Wawro, M., & Plaxco, D.** (2023, January). *Inquiry Oriented Linear Algebra: Exploring determinants*. Workshop presented as part of the Joint Mathematics Meetings, Boston, MA.
- Wawro, M., & Thompson, J.** (2022, October). *Recognizing matrix equations as eigenequations or not: Examples of student reasoning in quantum mechanics*. Poster presented at 4th Conference of the International Network for Didactic Research in University Mathematics. Hannover, Germany.
- Mauntel, M., Wawro, M., Zandieh, M., Andrews-Larson, C., & Plaxco, D.** (2022, August). *Collaborative Research: Extending Inquiry-Oriented Linear Algebra (IOLA-X)*. Poster presented at the MAA MathFest. Philadelphia, PA.
- Wawro, M., Zandieh, M., Andrews-Larson, C., & **Plaxco, D.** (2022, August). *Collaborative Research: Extending Inquiry-Oriented Linear Algebra (IOLA-X)*. Poster presented at the 2022 Improving Undergraduate Education (IUSE) Summit, National Science Foundation and American Association for the Advancement of Science, Washington, DC.
- Wawro, M.** (2022, June). *Student Reasoning about Linear Algebra in Quantum Mechanics*. Presentation given at the 24<sup>th</sup> Conference of the International Linear Algebra Society, Galway, Ireland.
- Wawro, M.** (2022, April). *Selected outcomes and reflections from the project: An Interdisciplinary Study of Learning: Student Understanding of Linear Algebra in Physics*. Presentation given at the Joint Mathematics Meetings, NSF Special Session on Outcomes and Innovations from NSF Undergraduate Education Programs in the Mathematical Sciences. [virtual conference because of COVID-19]
- Mauntel, M., Plaxco, D., & Wawro, M.** (2022, April). *Determining the Determinant: Using GeoGebra to visualize and measure spatial distortion*. Presentation given at the Joint Mathematics Meetings of the Mathematical Association of America and the American Mathematical Society, AMS Session on Innovative and Effective Ways to Teach Linear Algebra. [virtual conference because of COVID-19]
- Schermerhorn, B., & Wawro, M.** (2022, February). *Students’ conceptual understanding of normalization of vectors from  $\mathbb{R}^2$  and  $\mathbb{C}^2$* . Paper presented at the 24<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, SIGMAA on RUME, Boston, MA.
- Serbin, K. S., & Wawro, M.** (2022, February). *Ways that student reasoning about linear algebra concepts can support flexibility in solving quantum mechanics problems*. Paper presented at the 24<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, SIGMAA on RUME, Boston, MA.

- Bergman, A. M., Bresock, K., & Wawro, M.** (2022, February). *Education research at the interface of mathematics and science: Graphical reasoning across and within the disciplines*. Working group organized at the 24<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, SIGMAA on RUME, Boston, MA.
- Lee, I., Betterworth, Z., Zandieh, M., Wawro, M., & Quinlan, I.** (2022, February). *Student thinking in an inquiry-oriented approach to teaching least squares*. Paper presented at the 24<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, SIGMAA on RUME, Boston, MA.
- Kerrigan, S., Wawro, M., Plaxco, D., Mauntel, M., & Quinlan, I.** (2022, February). *Exploring student generalizations about 2x2 determinants from using a GeoGebra applet*. Poster presented at the 24<sup>th</sup> Conference on Research in Undergraduate Mathematics Education, SIGMAA on RUME, Boston, MA.
- Rasmussen, C., Wawro, M., & Zandieh, M.** (2022, February). *Student reinvention of Euler's method: An integrated analysis of one small group's individual and collective mathematical progress*. Paper presented at the 12<sup>th</sup> Congress of European Research in Mathematics Education, Bolzano, Italy. [virtual conference because of COVID-19]
- Wawro, M., Thompson, J., & Watson, K.** (2021, July). *Student reasoning about eigenequations in mathematics and quantum mechanics*. Paper presented at the 14<sup>th</sup> International Congress on Mathematical Education, Shanghai, China. [presented virtually because of COVID-19]
- Serbin, K. S., & Wawro, M.** (2021, June). *Students' understanding of linear algebra concepts underlying a procedure in a quantum mechanics task*. Paper presented at the 42<sup>nd</sup> annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Mazatlán, Mexico. [presented virtually because of COVID-19]
- Wawro, M.** (2021, May). *Inquiry-Oriented Linear Algebra*. Invited presentation given in the "Linear Algebra Education for the Modern World" mini-symposium, SIAM Conference on Applied Linear Algebra. [virtual conference because of COVID-19]
- Plaxco, D., Wawro, M., Zandieh, M., & Andrews-Larson, C. (2020, August). *An Inquiry-Oriented Approach to Determinants: New Materials from the IOLA Project*. Workshop accepted to be part of MathFest, Philadelphia, PA. [Conference canceled due to COVID-19]
- Wawro, M., Thompson, J., & Watson, K.** (2020, February). *Student Meanings for Eigenequations in Mathematics and in Quantum Mechanics*. Paper presented at the 23<sup>rd</sup> Annual Conference on Research in Undergraduate Mathematics Education, Boston, MA.
- Serbin, K. S., Storms, R., & Wawro, M.** (2020, February). *Students' Language about Basis and Change of Basis in a Quantum Mechanics Problem*. Paper presented at the 23<sup>rd</sup> Annual Conference on Research in Undergraduate Mathematics Education, Boston, MA.
- Wawro, M., Zandieh, M., Andrews-Larson, C. & Plaxco, D.** (2020, January). *Promoting Inquiry in Linear Algebra with Student Videos, Reflections, and Portfolios*. Presentation given at the Joint Mathematics Meetings of the Mathematical Association of America and the American Mathematical Society [MAA Session on Inquiry-Based Learning and Teaching], Denver, CO.
- Hagman, J., & Wawro, M.** (2020, 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 [MAA Poster Session: Projects Supported by the NSF Division of Undergraduate Education], Denver, CO.
- Wawro, M.** (2019, August). *Using Videos, Reflections, and Portfolios to Promote Inquiry*. Talk given at MathFest, Cincinnati, OH.
- Wawro, M., Hagman, J.E., & Musgrave, S.** (2019, August). *The MPWR Seminar: Mentoring and Partnerships for Women in RUME*. Poster presented at MathFest, Cincinnati, OH.
- Wawro, M., Thompson, J., & Watson, K.** (2019, July). *Student Meanings for Eigenequations in Mathematics*

*and in Quantum Mechanics*. Invited talk given at the Annual Physics Education Research Conference (Parallel Session on Representing student reasoning about math in physics), Provo, UT.

**Wawro, M., Christensen, W., & Watson, K.** (2019, July). *Student Reasoning about Eigenvectors and Eigenvalues from a Resources Perspective*. Juried Talk given at the Annual Physics Education Research Conference, Provo, UT.

**Wawro, M., Thompson, J., & Watson, K.** (2019, July). *Student Interpretation of Eigenequations in Mathematics and in Quantum Mechanics*. Talk given at the Summer Meeting of the American Association of Physics (PER Session: Student Content Understanding, Problem-solving and Reasoning), Provo, UT.

**Wawro, M., Watson, K., & Christensen, W.** (2019, February). *Student reasoning about eigenvectors and eigenvalues from a resources perspective*. Paper presented at the 22<sup>nd</sup> Annual Conference on Research in Undergraduate Mathematics Education, Oklahoma City, OK.

**Serbin, K. S., Sanchez-Robayo, B., Watson, K., Truman, J., Jiang, S., & Wawro, M.** (2019, February). Characterizing conceptual and procedural knowledge of the characteristic equation. Paper presented at the 22<sup>nd</sup> Annual Conference on Research in Undergraduate Mathematics Education, Oklahoma City, OK.

**Serbin, K.S., Storms, R., & Wawro, M.** (2019, February). Student reasoning about basis and change of basis in a quantum mechanics problem. Poster presented at the 22<sup>nd</sup> Annual Conference on Research in Undergraduate Mathematics Education, Oklahoma City, OK.

**Wawro, M., Watson, K., & Christensen, W.** (2018, August). *Student reasoning about eigenvectors and eigenvalues from a resources perspective*. Poster presented at the Annual Physics Education Research Conference, Washington, DC.

**Christensen, W., Watson, K., & Wawro, M.,** (2018, August). *Student reasoning about eigenvectors and eigenvalues from a resources perspective*. Contributed talk given at the American Association of Physics Teachers Summer Meeting, Washington, DC.

**Robinson, A., Simonetti, J. H., Richardson, K. L., Esmaili, S., Grimes, M., Lewis, S. N., McConnell, K. D., Pleimling, M. J., Sible, J., Sorenson, K. J., Vengrin, C., & Wawro, M.** (2018, August). *Positive attitudinal gains and reduced gender gap in a first year physics experience*. Poster presented at the Annual Physics Education Research Conference, Washington, DC.

**Simonetti, J., Robinson, A., Richardson, K. L., Esmaili, S., Grimes, M., Lewis, S. N., McConnell, K. D., Pleimling, M. J., Sible, J., Sorenson, K. J., Vengrin, C. & Wawro, M.** (2018, August). *A first-year experience program in physics*. Poster presented at the 2018 Summer Meeting of the American Association of Physics Teachers, Washington, DC.

**Wawro, M., Zandieh, M., & Watson, K.** (2018, April). *Delineating aspects of understanding eigentheory through assessment development*. Paper presented at the International Network for Didactic Research in University Mathematics (INDRUM), Kristiansand, Norway.

**Esmaili, S., Richardson, K. L., Lewis, S. N., Vengrin, C., Sible, J. C., Robinson, A., Pleimling, M., Simonetti, J., Sorenson, K., & Wawro, M.** (2018, April.) *The effectiveness of a summer bridge program in integrating math into science instruction*. Poster presented at the 102<sup>nd</sup> meeting of the American Educational Research Association, New York, NY.

**Esmaili, S., Richardson, K. L., Simonetti, J. H., Robinson, A., Sorenson, K., Vengrin, C., Wawro, M., Pleimling, M., & Sible, J. C.** (2018, February). *Math, problem solving, and SCALE-UP in an integrated science curriculum and a physics first-year experience program*. Paper presented at the 41st meeting of the Eastern Educational Research Association, Clearwater, FL.

**Wawro, M., Watson, K., & Zandieh, M.** (2018, February). *Student Understanding of Linear Combinations of Eigenvectors*. Paper presented at the 21<sup>st</sup> Conference on Research in Undergraduate Mathematics Education, San Diego, CA.

**Wawro, M., Watson, K., & Christensen, W.** (2018, February). *Quantum Physics Students' Reasoning about*

*Eigenvectors and Eigenvalues*. Poster presented at the 21<sup>st</sup> Conference on Research in Undergraduate Mathematics Education, San Diego, CA.

**Musgrave, S.,** Hagman, J.E., Melhuish, K., Thanheiser, E., & Wawro, M. (2018, February). *MPWR-ing Women in RUME: Continuing Support*. Poster presented at the 21<sup>st</sup> Conference on Research in Undergraduate Mathematics Education, San Diego, CA.

**Robinson, A.,** Simonetti, J. H., Richardson, K. L., Esmaceli, S., Grimes, M., Lewis, S. N., McConnell, K. D., Pleimling, M., Sible, J. C., Sorenson, K., Vengrin, C., & Wawro, M. (2018, January). *A study of learning and attitudinal gains in a first-year physics experience*. Poster presented at the 2018 meeting of the American Association of Physics Teachers, San Diego, CA.

**Wawro, M.,** Zandieh, M., & Plaxco, D. (2017, November). *An Inquiry-Oriented Approach to the Guided Reinvention of Eigentheory*. Paper presented at the 11th Southern Hemisphere Conference on the Teaching and Learning of Undergraduate Mathematics and Statistics (DELTA), Gramado, Brazil.

**Wawro, M.,** Watson, K., & **Christensen, W.** (2017, July). *Investigating Students' Meta-Representational Competence with Matrix Notation and Dirac Notation*. Paper presented at the Physics Education Research Conference, Cincinnati, OH.

**Wawro, M.** (2017, July). *Inquiry-Oriented Linear Algebra (IOLA): An Overview and an Example*. Presentation given at the Meeting of the International Linear Algebra Society, Ames, IA.

**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.

**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 & 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 University Mathematics (INDRUM), 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 Eighteenth 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 Sixteenth Conference on Research in Undergraduate Mathematics Education, Denver, CO.
- Rasmussen, C., Wawro, M., & Zandieh, M.** (2015, February). *Examining individual and collective level mathematical progress*. Paper presented at the Eighteenth 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 Eighteenth 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 Sixteenth 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 Sixteenth 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 Fourteenth 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 Fourteenth 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 9th 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 13th 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.

## GRADUATE STUDENT SUPERVISION

- Kevin Watson (advisor), PhD, Virginia Tech, 2020 (awarded posthumously)  
Dissertation Title: *Students' Conceptions of Normalization*
- George Kuster (advisor), PhD, Virginia Tech, 2016  
Dissertation Title: *On the Role of Student Understanding of Function and Rate of Change in Learning Differential Equations*  
Current position: Associate Professor, Christopher Newport University
- David Plaxco (advisor), PhD, Virginia Tech, 2015

Dissertation Title: *Relating Understanding of Inverse and Identity to Engagement in Proof in Abstract Algebra*

Current position: Lecturer: University of Georgia

- Kyle Flanigan (committee member), PhD, Virginia Tech, 2023  
Current position: Instructor, Virginia Tech
- Sarah Kerrigan (committee member), PhD, Virginia Tech, 2022  
Current position: Assistant Professor, George Fox University
- Kaitlyn Serbin (committee member), PhD, Virginia Tech, 2021  
Current position: Assistant Professor, University of Texas Rio Grande Valley
- Ahsan Chowdhury (committee member), PhD, Virginia Tech, 2021  
Current position: Term Assistant Professor, George Mason University
- Rachel Rupnow (committee member), PhD, Virginia Tech, 2019  
Current position: Assistant Professor, Northern Illinois University
- Steven Boyce (committee member), PhD, Virginia Tech, 2014  
Current position: Associate Professor, Portland State University
- Co-advisor (w/ Anderson Norton) for current doctoral student: Matthew Park
- Academic advisor for current doctoral student: Jacob Lineberry
- Doctoral committee member: Andi Pina, University of Maine, Physics, 2024
- External Reviewer: Inyoung Lee, Arizona State University, Mathematics, 2024
- External Examiner for PhD Thesis: Vera Baumgartner, ETH Zurich, Learning Sciences, 2023
- External Evaluator for PhD Thesis: Odd Petter Sand, University of Oslo, 2021
- Doctoral committee member: Janet Sipes, Arizona State University, Mathematics, 2019
- Master's thesis committee member: Marilin Kelley, Virginia Tech, 2020; Corinne Mitchell, Virginia Tech, 2023
- Master's presentation committee member: Adam Bradie, Virginia Tech, 2024; Lindy Hearne, Virginia Tech, current
- Master's presentation advisor for Neal Aronson, 2012
- Committee member for many students, MAEd, Curriculum and Instruction, Virginia Tech, since 2012

## REVIEWER FOR PROFESSIONAL JOURNALS

- *Journal for Research in Mathematics Education*
- *International Journal of Research in Undergraduate Mathematics Education*
- *Physical Review Physics Education Research*
- *Educational Studies in Mathematics*
- *ZDM- Mathematics Education*
- *Cognition and Instruction*
- *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)*
- *La Matematica*

## REVIEWER FOR PROFESSIONAL CONFERENCES

- Special Interest Group of the Mathematical Association of America on Research in Undergraduate Mathematics Education (RUME)
- Congress for European Research in Mathematics Education (CERME)
- International Congress of Mathematics Education (ICME)
- Joint Mathematics Meetings and MathFest
- International Network for Didactic Research in University Mathematics (INDRUM)

- International Group for the Psychology of Mathematics Education, North American Chapter Annual Conference (PME-NA)

## MEMBERSHIPS IN PROFESSIONAL SOCIETIES

- Mathematical Association of America (MAA) and Special Interest Group of the MAA on Research in Undergraduate Mathematics Education (SIGMAA on RUME)
- Associate for Women in Mathematics (AWM)
- American Association of Physics Teachers (AAPT)
- International Linear Algebra Society (ILAS)
- European Society for Research in Mathematics Education (ERME)

## SERVICE TO THE RESEARCH COMMUNITY

- Editorial Board, *International Journal for Research in Undergraduate Mathematics Education*, 2016-present
- Program Chair (elected position) of the Executive Committee, SIGMAA on RUME, 2016-2020
- MAA MathFest Invited Address Committee, 2020
- Planning Committee for the *Annual Conference on Research in Undergraduate Mathematics Education*, 2012-2024
- Scientific Committee for conferences for the *International Network for Didactic Research in University Mathematics* (INDRUM)
- Program Committee for the 2026 *International Network for Didactic Research in University Mathematics* (INDRUM) Conference, Dubrovnik, Croatia
- Math Alliance mentor, 2021-present
- Association for Women in Mathematics (AWM) Hay Award Selection Committee, 2021-2023
- Lead developer for the NSF-funded Inquiry-Oriented Linear Algebra (IOLA) curriculum materials. Materials maintained and available to interested university instructors at <http://iola.math.vt.edu>
- Advisory Board member and consultant, NSF EDU DUE, *Collaborative Research: Collaborating with Mathematicians to Enhance Teaching (COMET)* (#2315058, 2315056, 2315057), K. Weber (Rutgers, lead PI), E. Johnson (Virginia Tech, PI), T. Fukawa-Connelly (Temple, PI), L. Carbone (Rutgers, co-PI), \$399,324, 2023-2026.
- Advisory Board, NSF ECR DBER DCL, *Investigating Undergraduate Chemistry Students' Reasoning and Conceptual Change Related to Graphs of Particulate-Level Variability* (# 1954861), N. Becker (University of Iowa, PI), \$496,573, 2021-2024.
- Advisory Board, NSF *Collaborative Research: Beyond Procedures: A research-based approach to teaching mathematical methods in physics* (PHY #1912152, 1912660, 1912087), W. Christensen (North Dakota State University, lead PI), M. Loverude (Cal State Fullerton, PI), J. Thompson (University of Maine, PI), \$938,387, 2019-2024.
- Consultant, NSF Innovations in Undergraduate STEM Education, *Simulation-Based Inquiry-Oriented Linear Algebra* (#1712524); M. Zandieh (PI), A. Amresh, D. Plaxco (co-PIs), \$299,999, 2017-20.
- Curriculum Advisory Board, NSF 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, 2014-2017.
- Executive Committee, NSF Innovations in Undergraduate STEM Education *Pedagogical Initiatives in Linear Algebra* project (#1822247); S. Stewart (University of Oklahoma, PI), \$49,286, 2018-2020.
- Executive Committee, NSF 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; Sepideh Stewart, University of Oklahoma; Gil Strang, MIT) of the *Innovative and Effective Ways to Teach Linear Algebra* session at the Joint Mathematics Meetings (sponsored by ILAS in 2023, AMS in 2022, and MAA in 2014-2020)
- Co-organizer (with Rachel Quinlan, National University of Ireland, Galway) of the Mathematics

- Education mini-symposium at the Annual Meeting of the International Linear Algebra Society, 2017
- Co-organizer of the *Mentoring and Partnerships for Women in RUME (MPWR)* Seminar, a one-day seminar that occurred before the Annual RUME Conference in February, 2013-2020
  - Co-organizer of the Math-Science Working Group, Annual Conference on Research in Undergraduate Mathematics Education, 2013, 2015, 2022
  - Panel reviewer for EHR Directorate at the National Science Foundation, including CAREER
  - Reviewer for the Israeli National Science Foundation
  - External reviewer for various tenure and/or promotion applications in mathematics education
  - 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**

- University Council, College of Science representative, 2020-2022
- College of Science Collegiate Faculty and Professor of Practice Promotion Committee, 2018–present
- Mathematics Department Chair Review Committee, 2022
- Mathematics Department Postdoctoral Researcher Search Committee, 2022
- Mathematics Department Executive Committee, 2019-2021, 2023-2025
- Mathematics Department Mathematics Education Program Committee, 2011-present
- Mathematics Department Travel Fund Committee, 2018-2022
- Mathematics Department Computational Resource Committee, 2019-2022
- Mathematics Department Undergraduate Program Committee, 2013-2016, 2017-2018, 2022-2024
- Mathematics Department Scholarship Committee, 2012-2014
- Mathematics Department Chair Position Search Committee, 2022-2023
- Mathematics Department Mathematics Education tenure-track position Search Committee, 2012-2013
- Mathematics Department Patricia A. Caldwell Postdoctoral Researcher Search Committee, 2016-2017
- College of Science Integrated Science tenure-track position Search Committee, 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 *MATH 2114 Introduction to Linear Algebra*, first offered and made permanent in Fall 2014
- MATH 2114 Course Co-Coordinator, 2014