

# Fran Arbaugh Vita

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## Education

**Ph. D.** Curriculum & Instruction/Mathematics Education. Indiana University. Bloomington, Indiana. November 2000.

Ph. D. Dissertation: "Time on Tasks: Influences of a Study Group on Secondary Math Teachers' Knowledge, Thinking, and Teaching." Directed by Dr. Catherine A. Brown. Indiana University. Bloomington, Indiana.

**M. Ed.** Curriculum & Instruction/Secondary Mathematics Education. Virginia Commonwealth University. Richmond, Virginia. May 1996.

**Teacher Certification** in Secondary Mathematics. Virginia Commonwealth University and J. R. Reynolds Community College. Richmond, Virginia. May 1985.

**B.S.** Family and Child Development/Option in Human Services. Virginia Tech. Blacksburg, Virginia. June 1983.

## Professional Experience

**Professor of Mathematics Education and Curriculum & Supervision:** The Pennsylvania State University, University Park, Pennsylvania. July 1, 2020 – Present.

**Associate Professor of Mathematics Education and Curriculum & Supervision:** The Pennsylvania State University, University Park, Pennsylvania. August 2009 – Present.

**Associate Professor of Mathematics Education:** University of Missouri, Columbia, Missouri. September 2007 – August 2009.

**Assistant Professor of Mathematics Education:** University of Missouri, Columbia, Missouri. January 2001 – August 2007.

**Doctoral Teaching/Research Assistant:** Department of Curriculum & Instruction. Indiana University, Bloomington, Indiana. August 1996 – December 2000.

**Adjunct Faculty:** Department of Teaching and Learning. Indiana University/Purdue University – Indianapolis (IUPUI), Indianapolis, Indiana. Summer 1998.

**Field Placement Coordinator:** Department of Curriculum & Instruction/Elementary Mathematics and Science Preservice Teachers. Indiana University. Bloomington, Indiana. August 1996-May 1997.

**High School Mathematics Teacher:** Manchester High School, Chesterfield County, Virginia.  
August 1985 – June 1996.

## Honors and Awards

### *Scholarship Awards*

Association of Mathematics Teacher Educators (AMTE) **Excellence in Scholarship in Mathematics Teacher Education** (2017)

### *Teaching Awards*

Missouri Council of Teachers of Mathematics (MCTM) **Post-Secondary Mathematics Teacher of the Year** (2007)

MU **William T. Kemper Fellowship for Teaching Excellence** (2007)

MU **Excellence in Education Award** (2005)

MU College of Education **High Flyer Teaching Award** for Outstanding Student Evaluation of Teaching (in one or more courses during the 2006-07, 2004-05, 2003-04, 2001-02, and 2000-01 academic years)

**Outstanding Mathematics Teacher.** Tandy Corporation (1994-1995)

**Teacher of the Year.** Manchester High School (1993-1994)

### *Extension (Professional Development for Mathematics and/or Science Teachers)*

*Pennsylvania Mathematics Initiative (PMI) in State College Area School District (SCASD).* Co-facilitate academic-year, monthly full-day PD focused on mathematics content and pedagogy for SCASD elementary teachers. Fall 2017 through Spring 2022.

*Palmyra School District PD Day.* Co-facilitated a day-long workshop focused on fraction concepts and the role of learning goals in guiding instructional decisions. August 8, 2017.

*Curwensville Area School District Inservice Day.* Co-facilitated a day-long workshop focused on fraction concepts and CGI. February 20, 2017.

*Pennsylvania Mathematics Initiative (PMI).* Content/Pedagogy workshops for PA grades K-5 teachers. Two-week institute held on UP campus and one follow-up meeting during school year; July 2014; 2015, 2016, 2017, 2018. One-week institute held on PSU Greater Allegheny campus; August 2016.

*Math Collaborative.* 9-12 mathematics teachers in Seneca Valley, PA Public Schools. 2014-2015; 2015-2016. Each year: monthly day-long meetings.

*MathWorks.* 6<sup>th</sup>-grade mathematics teachers in Middletown, NY public schools. 2014-2015; 2015-2016; 2016-2017. One week workshop in 2014-15 and 2015-16 plus 2 rounds of 2-3 days of classroom visits (each set of visits included an after-school workshop). In 2016-17 the 2 classroom visit trips included 2 days of being in classrooms and 1 day of workshop. In 2017, 3 multi-day visits (January, September, November) included facilitating PD workshops, conducting classroom observations, and Studio Day PD.

*Productive Math Talk Moves*. State College Area School District K-5 Curriculum day workshops, November 4, 2011. Co-presented with Andrea McCloskey and MJ Kitt.

*Task Transformation to Promote 21<sup>st</sup> Century Mathematical Thinking Workshop*. University of Virginia Office of Mathematics Outreach. Charlottesville, VA. August 3-4, 2011.

*Hurricane Workshop for the Middle Grade Earth and Space Science Education project*. Central Pennsylvania science teachers – funded through the National Science Foundation as a Targeted Math Science Partnership. State College, PA. June 27-July 1, 2011.

*Supporting Teachers: Amplifying Children’s Knowledge (STACK)*. Mathematics and Science Partnership (MSP) project. Columbia Public Schools - funded through the Missouri Department of Elementary and Secondary Education. January 2007-June 2009; June 2010.

Columbia Public Schools (CPS) Secondary Mathematics Curriculum Day (August 2007)

CPS Elementary Mathematics Leaders (February 2006)

CPS Elementary Teachers (August 2005)

*Core-Plus Workshops for CPS 8-12 Teachers* (Summers 2005, 2004, 2003; February 2003; November 2002)

K-12 CPS Mathematics Week (Summer 2005)

*Connected Mathematics Project Workshops for CPS* (Summers 2004, 2003)

*Mathematics and Science Teacher Leadership Academy* (Summers 2006, 2005, 2004)

## **Books Authored and Edited**

Arbaugh, F., Smith, M. S., Boyle, J., Stylianides, G., & Steele, M. (2019). *We reason and we prove in all mathematics: Putting critical skills at the heart of your mathematics teaching, grades 6-12*. Thousand Oaks, CA: Corwin Publishing.

Wieman, R., & Arbaugh, F. (2013). *Success from the start: Your first years of teaching secondary mathematics*. Reston, VA: National Council of Teachers of Mathematics.

Friel, S. N., Arbaugh, F., Mooney, E. S., Pugalee, D. K., Watanabe, T., & Smith, M. S. (2009). *Navigating through Problem Solving in Grades 6-8*. Reston, VA: National Council of Teachers of Mathematics.

Arbaugh, F., & Taylor, P. M. (Eds.). (2008). *Inquiry into mathematics teacher education*. Monograph 5 of the Association of Mathematics Teacher Educators (AMTE). San Diego, CA: AMTE.

Meyer, M., Langrall, C., Arbaugh, F., Webb, D., & Hoover, M. (Eds.). (2008). *A decade of middle school mathematics curriculum implementation: Lessons learned from the Show-Me Project*. Charlotte, NC: Information Age Publishing.

Pugalee, D., Arbaugh, F., Bay-Williams, J., Farrell, A., Mathews, S., & Royster, D. (2008). *Navigating through Connections in Grades 6-8*. Reston, VA: National Council of Teachers of Mathematics.

## Refereed Journal Articles

Arbaugh, F., Graysay, D., Freeburn, B. & Konuk, N. (2021). Investigating secondary mathematics preservice teachers' instructional vision: Learning to teach through pedagogies of practice. *Journal of Teacher Education*, 72(4), 448-461.

Cirillo, M., LaRochelle, R., Arbaugh, F., & Bieda, K. N. (2020). An innovative early field experience for secondary teachers: Early results from shifting to an online model. *Journal of Technology and Teacher Education*, 28(2), 353-363.

Arbaugh, F., Graysay, D., Konuk, N., & Freeburn, B. (2019). The three-minute-rehearsal cycle of enactment and investigation: Preservice secondary mathematics teachers learning to elicit and use evidence of student thinking. *Mathematics Teacher Educator* (8)1, 22-48.

Bannister, N., Arbaugh, F. & Simpson, A. (in preparation). Analyzing individual teacher learning within a community of practice: Theorizing an empirical methodology. Manuscript in preparation for the *Journal of Teacher Education*.

Arbaugh, F., Bannister, N., & Simpson, A. (in preparation). Learning as a beginning mathematics teacher: The longitudinal case of Mericel. Manuscript in preparation for the *Journal of Mathematics Teacher Education*.

Arbaugh, F., Graysay, D., Freeburn, B., & Konuk, N. (in review). Investigating secondary mathematics preservice teachers' instructional vision: Learning to teach through a pedagogies of practice perspective. Submitted (Dec 2018) *Journal of Teacher Education*.

Freeburn, B., & Arbaugh, F. (2017). Talking to students: Supporting productive struggle. *Mathematics Teacher*, 111(3), 176-181.

Appova, A., & Arbaugh, F. (2017). Teachers' motivation to learn: Implications for supporting professional growth. *Professional Development in Education*, 44(1), 5-21.

Arbaugh, F., Marra, R., Lannin, J. K., Merle, D., Cheng, Y., & Smith, R. (2016). Supporting university content specialists in providing effective professional development: The educative role of evaluation. *Teacher Development*, 20, 538-554.

Arbaugh, F., Ball, D. L., Grossman, P., Heller, D., & Monk, D. (2015). Dean's corner: Views of the state of teacher education in 2015. *Journal of Teacher Education*, 66, 435-445.

Weiman, R. & Arbaugh, F. (2014). How to create effective mathematics homework. *Mathematics Teaching in the Middle School*, 20(3), 160-165.

\*Karunakaran, S., \*Freeburn, B., \*Konuk, N., & Arbaugh, F. (2014). Improving preservice secondary mathematics teachers' capability with generic example proofs. *Mathematics Teacher Educator*. 2(2), 158-170. <http://dx.doi.org/10.5951/mathteaceduc.2.2.0158>

- Lannin, J. K., \*Webb, M., Chval, K. B., Arbaugh, F., \*Hicks, S., \*Taylor, C. & \*Bruton, R. (2013). The development of beginning mathematics teacher pedagogical content knowledge. *Journal of Mathematics Teacher Education*, 16(6), 403-426. doi: 10.1007/s10857-013-9244-5
- Marra, R. M., Arbaugh, F., Lannin, J., Abell, S., Ehlert, M., \*Smith, R., \*Park Rogers, M. (2011). Orientations to professional development design and implementation: Understanding their relationship to PD outcomes across multiple projects. *International Journal of Science and Mathematics Education*, 9(4), 793-816. <http://dx.doi.org/10.1007/s10763-010-9223-6>
- Boone, W. J., Abell, S. K., Volkmann, M. J., Arbaugh, F., & Lannin, J. K. (2011). Evaluating selected perceptions of science and mathematics teachers in an alternative certification program. *International Journal of Science and Mathematics Education*, 9(3), 551-569. <http://dx.doi.org/10.1007/s10763-010-9205-8>
- Arbaugh, F., Chval, K., Van Garderen, D., Lannin, J., & \*Cummings, L. (2010). Supporting the Transition from Experienced Teacher to Mathematics Coach. *Journal of Mathematics Education Leadership*, Spring 2010, 13-19.
- Chval, K. B., Arbaugh, F., Van Garderen, D., Lannin, J.K., \*Cummings, L., \*Duchene, A., & \*Huey, M. (2010). The transition from experienced teacher to mathematics coach: Establishing a new identity. *The Elementary School Journal*, 111(1), 191-216. <http://dx.doi.org/10.1086/653475>
- \*Park Rogers, M. A., Abell, S. K., Marra, R. M., Arbaugh, F., \*Hutchins, K. L., & Cole, J. S. (2010). Orientations to science teacher professional development: An exploratory study. *Journal of Science Teacher Education*, 21(3), 309-328. <http://dx.doi.org/10.1007/s10972-009-9179-y>
- Chval, K.B., Lannin, J., Arbaugh, F., & \*Bowzer, A. (2009). Videos and prospective teachers. *Teaching Children Mathematics*, 16(2), 98-105.
- \*Hutchins, K., Arbaugh, F., Abell, S., Marra, R., & \*Lee, M. (2008). A consumer guide to professional development. *Science Scope*, 31(8), 16-19.
- Friedrichsen, P., Lannin, J., Abell, S., Arbaugh, F., & Volkmann, J. (2008). Examining incoming identities in an alternative certification program for mathematics and science. *Eurasia Journal of Mathematics, Science & Technology Education*, 4(2), 175-188.
- Arbaugh, F., Abell, S., Lannin, J., Volkmann, M., & Boone, W. (2007). Field-based internship models for alternative certification of science and mathematics teachers: Views of interns, mentors, and university educators. *Eurasia Journal of Mathematics, Science & Technology Education*, 3(3), 191-201.
- Lannin, J. K., Arbaugh, F., \*Barker, D. D., & \*Townsend, B.E. (2006). Making the most of student errors. *Teaching Children Mathematics*, 13(3), 182-186.

- Arbaugh, F., Lannin, J., \*Jones, D. L., & \*Park Rogers, M. (2006). Examining instructional practices in Core-Plus lessons: Implications for professional development. *Journal of Mathematics Teacher Education*, 9(6), 517-550. <http://dx.doi.org/10.1007/s10857-006-9019-3>
- Abell, S., Boone, W., Arbaugh, F., Lannin, J., \*Beilfuss, M., Volkmann, M, & White, S. (2006). Recruiting future science and mathematics teachers into alternative certification programs: Strategies tried and lessons learned. *Journal of Science Teacher Education*, 17(3), 165-183. <http://dx.doi.org/10.1007/s10972-005-9001-4>
- Arbaugh, F. & Brown, C. A. (2005). Analyzing mathematical tasks: A catalyst for change? *Journal of Mathematics Teacher Education*, 8, 449-536. <http://dx.doi.org/10.1007/s10857-006-6585-3>
- \*Jones, D. L., & Arbaugh, F. (2004). Take time for action: What do students know about time? *Mathematics Teaching in the Middle School*, 10(2), 82-84.
- Arbaugh, F. (2003a). Study groups as a form of professional development for secondary mathematics teachers. *Journal of Mathematics Teacher Education* 6(2), 139-163. <http://dx.doi.org/10.1023/A:1023928410992>
- Arbaugh, F. (2003b). Study groups: Professional growth through collaboration. *Mathematics Teacher*, 96(3), 188-191.
- Arbaugh, F., \*\*Scholten, C. & Essex, K. (2001). Data in the middle grades: A probability webquest. *Mathematics Teaching in the Middle School*, 7(2), 90-95.
- Reys, B., & Arbaugh, F. (2001). Clearing up the confusion over calculator use in grades K-5. *Teaching Children Mathematics*, 8(2), 90-94.

## Book Chapters

- Arbaugh, F., McGraw, R., & Patterson, C. L. (2019). Collaborations between mathematics educators and mathematicians for mathematics teacher education in the United States. Accepted for publication in G. M. Lloyd (Ed.), *Participants in mathematics teacher education* (Vol. 3, *International handbook of mathematics teacher education*, O. Chapman, Ed.). Rotterdam: Sense Publishers.
- Bannister, N. & Arbaugh, F. (2018). Supporting spotlight teachers in video-based collaborative learning settings. In O. Cavero & N. L. Calvet (Eds.), *Advanced learning and teaching environments: Innovations, content and methods*. DOI: 10.5772/intechopen.74030.
- Arbaugh, F., Adams, A., Teuscher, D., van Zoest, L., & Wieman, R. (2017). Situating learning for secondary mathematics preservice teachers within the context of rehearsals: Challenges and resulting adaptations. In S. Kastberg, A. Tyminski, A. Lischka, & W. Sanchez (Eds.). *Building support for scholarly practices in mathematics methods* (pp. 133-148). Charlotte, NC: Information Age Publishing.

- Arbaugh, F., Briars, D., & Miles, V. (2017). The role of professional organizations. In N. Rigelman & M. McGatha (Eds.), *Elementary mathematics specialists* (pp. ). Charlotte, NC: Information Age Publishing.
- Arbaugh, F., & Thomas, C. (2016). Forward. In D. White, S. Crespo, & M. Civil (Eds), *Cases for mathematics teacher educators: Facilitating questions about inequities in mathematics classrooms* (pp. ?). Charlotte, NC: Information Age Publishing.
- Smith, M.S., Boyle, J., Arbaugh, F., Steele, M.D., & Stylianides, G. (2014). Cases as a vehicle for developing knowledge needed for teaching. In Y. Li & E. A. Silver (Eds.), *Transforming mathematics instruction: Multiple approaches and practices* (pp. 311-333). Switzerland: Springer International Publishing.
- Arbaugh, F., Nolan, J., Parks, K., & Burns, R. (2012). The practices and knowledge of school-based teacher education practitioners. In M. Macintyre Latta & S. Wunder (Eds.). *Placing practitioner knowledge at the center of teacher education: Rethinking the policy and practice of the education doctorate* (pp. 105-123). Charlotte, NC: Information Age Publishing.
- Arbaugh, F. (2011). The Learning Principle: Supporting the development of mathematical proficiency. In G. M. Lloyd and V. R. Pitts Bannister (Eds.), *Curriculum-based activities and resources for pre-service math teachers*. Reston, VA: National Council of Teachers of Mathematics.
- Arbaugh, F., Lannin, J. K., Jones, D. L., & Barker, D. (2010). Textbook-specific professional development: Impacting teachers' knowledge and views. In J. Luebeck, & J. W. Lott (Eds.), *Mathematics teaching: Putting research into practice at all levels* (Association of Mathematics Teacher Educators (AMTE) Monograph 7) (pp. 91-108). San Diego, CA: AMTE.
- Arbaugh, F. (2010). Secondary mathematics teachers' classroom practices. In J. Lobato, & F. K. Lester Jr. (Eds.), *Teaching and learning mathematics: Translating research to the secondary classroom* (pp. 45-51). Reston, VA: National Council of Teachers of Mathematics.
- Arbaugh, F. (2010). Qualities of effective secondary mathematics teachers. In J. Lobato, & F. K. Lester Jr. (Eds.), *Teaching and learning mathematics: Translating research to the secondary classroom* (pp. 53-59). Reston, VA: National Council of Teachers of Mathematics.
- Arbaugh, F. (2009). Learning from each other: Why (and how) to do classroom observations with your colleagues. In A Flores (Ed.), *Responding to diversity: Grades 9-12* (pp. 127-134). Reston, VA: National Council of Teachers of Mathematics.
- Arbaugh, F., & Avery, P. (2009). Enhancing the learning environment through student-led mathematical discussions. In A Flores (Ed.), *Responding to diversity: Grades 9-12* (pp. 7-16). Reston, VA: National Council of Teachers of Mathematics.

- Arbaugh, F. (2008). Engaging pre-service teachers in textbooks analyses: A focus on mathematical tasks. In P. M. Lutz (Ed.), *Secondary mathematics methods courses in California* (California Association of Teachers of Mathematics Monograph 1) (pp. 50-59). Available: <http://edweb.csus.edu/projects/camte/>
- Arbaugh, F. (2008). Teachers' needs at different phases of curriculum implementation. In M. Meyer, C. Langrall, F. Arbaugh, D. Webb, & M. Hoover (Eds.), *A decade of middle school mathematics curriculum implementation: Lessons learned from the Show-Me Project* (pp. 191-199). Charlotte, NC: Information Age Publishing.
- Meyer, M., & Arbaugh, F. (2008). Professional development for administrators: What they need to know to support curriculum adoption and implementation. In M. Meyer, C. Langrall, F. Arbaugh, D. Webb, & M. Hoover (Eds.), *A decade of middle school mathematics curriculum implementation: Lessons learned from the Show-Me Project* (pp. 201-210). Charlotte, NC: Information Age Publishing.
- Philips, E., Lappan, G., Grant, Y., & Arbaugh, F. (2008). An overview of professional development. In M. Meyer, C. Langrall, F. Arbaugh, D. Webb, & M. Hoover (Eds.), *A decade of middle school mathematics curriculum implementation: Lessons learned from the Show-Me Project* (pp. 141-150). Charlotte, NC: Information Age Publishing.
- Arbaugh, F., & Taylor, P. M. (2008). Inquiry into mathematics teacher education. In F. Arbaugh & P. M. Taylor (Eds.), *Inquiry into mathematics teacher education*. Monograph 5 of the Association of Mathematics Teacher Educators (AMTE) (pp. 1-9). San Diego, CA: AMTE.
- Smith, M., Arbaugh, F., & Fi, C. (2007). Teachers, the school environment, and students: Influences on students' opportunity to learn mathematics in grades 4 & 8. In P. Kloosterman & F. K. Lester (Eds.), *Results from the 2003 Mathematics Portion of the National Assessment of Educational Progress* (pp. 191-226). Reston, VA: National Council of Teachers of Mathematics.
- Lynch-Davis, K., & Arbaugh, F. (2006). Improving classroom assessment practices through analyzing NAEP items. In C. A. Brown & L. Clark (Eds.), *Learning from NAEP: Professional development materials for mathematics teachers* (pp. 124-147). Reston, VA: National Council of Teachers of Mathematics.
- Arbaugh, F., & Brown, C. A. (2004). What makes a mathematical task worthwhile? Designing a learning tool for high school mathematics teachers. In R. Rubenstein (Ed.), *Perspectives on the Teaching of Mathematics* (pp. 27-41). Reston, VA: National Council of Teachers of Mathematics.
- Smith, M. S., Stein, M. K., Arbaugh, F., Brown, C. A., & Mossgrrove, J. (2004). Characterizing the cognitive demands of mathematical tasks: A task-sorting activity. *Professional development guidebook for perspectives on the teaching of mathematics: Companion to the sixty-sixth yearbook* (pp. 45-72). Reston, VA: National Council of Teachers of Mathematics.



Arbaugh, F., Brown, C. A., Lynch, R. K., & McGraw, R. (2004). Students' ability to construct responses (1992-2000): Findings from short and extended constructed-response items. In P. Kloosterman & F. K. Lester (Eds.), *The 1990 through 2000 mathematics assessments of the National Assessment of Educational Progress: Results and interpretations* (pp. 337-362). Reston, VA: National Council of Teachers of Mathematics.

## Editorials

Arbaugh, F., Lloyd, G. M., Knight, S. L., Nolan, J., Edmondson, J., Whitney, A. E., & McDonald, S. (2013). Teacher learning and perceptions across the professional continuum. *Journal of Teacher Education, 64*(1).

Knight, S. L., Edmondson, J., Lloyd, G. M., Arbaugh, F., Nolan, J., Whitney, A. E., & McDonald, S. (2012). Examining the complexity of assessment and accountability in teacher education. *Journal of Teacher Education, 63*(5)

Lloyd, G. M., Arbaugh, F., Knight, S. L., Edmondson, J., Nolan, J., McDonald, S. P., & Whitney, A. E. (2012). Beyond the teacher certification program debate: From models to features. *Journal of Teacher Education, 63*(3).

Knight, S. L., Lloyd, G. M., Arbaugh, F., Edmondson, J., Nolan, J., McDonald, S. P., & Whitney, A. E. (2012). Adding to the knowledge base. *Journal of Teacher Education, 63*: 85-86.

Knight, S. L., Lloyd, G. M., Arbaugh, F., Edmondson, J., Nolan, J., McDonald, S. P., & Whitney, A. E. (2012). Getting our own house in order: From brick makers to builder. *Journal of Teacher Education, 63*(1).

Knight, S. L., Lloyd, G. M., Arbaugh, F., Edmondson, J., Nolan, J., McDonald, S. P., & Whitney, A. E. (2011). Advancing research, practice, and policy in teacher education. *Journal of Teacher Education, 62*: 429.

## Refereed Proceedings

Arbaugh, F., Graysay, D., Freeburn, B., & Konuk, N. (2021). Opportunities to learn in cycles of enactment and investigation. In D. Olanoff, K. Johnson, & S. M. Spitzer (Eds.), *Proceedings of the Forty-Third Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Productive Struggle: Persevering through Challenges* (pp. 890–898). Philadelphia, PA.

Graysay, D., Freeburn, B., Arbaugh, F., & Konuk, N. (2021). Prospective secondary mathematics teacher responses and the structure of approximations of practice. In D. Olanoff, K. Johnson, & S. M. Spitzer (Eds.), *Proceedings of the Forty-Third Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Productive Struggle: Persevering through Challenges* (pp. 871–879). Philadelphia, PA.

- Arbaugh, F., LaRochelle, R., Do, S., Cunningham, A., & Voogt, K., Cirillo, M., & Bieda, K. N. (2020). Real-time coaching with secondary preservice teachers: The practices of mathematics teacher educators. Brief Research Report in A. I. Sacristán, J. C. Cortés-Zavala, & P. M. Ruiz-Arias (Eds.), *Proceedings of the 42nd Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. (pp. 1567-1571). Mazatlán, Sinaloa, Mexico: Cinvestav/AMIUTEM/PME-NA.
- Gregg, J., LaRochelle, R., Cunningham, A., Do, S., Bieda, K., & Arbaugh, F. (2020). The UTE Model: Animating Pre-Service Teachers' Visions for Student Engagement. Poster in A. I. Sacristán, J. C. Cortés-Zavala, & P. M. Ruiz-Arias (Eds.), *Proceedings of the 42nd Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. (pp. 1718-1719). Mazatlán, Sinaloa, Mexico: Cinvestav/AMIUTEM/PME-NA.
- Bieda, K., Arbaugh, F. & Cirillo, M. (2019, November). The UTE model: Developing pre-service teachers' visions of high-quality mathematics instruction. In S.Otten, A.G.Candela, Z. de Araujo, C. Haines & C. Munter (Eds.), *Proceedings of the 41st annual conference for the North American chapter of the International Group for the Psychology of Mathematics Education conference* (p. 1376). St. Louis, MO: University of Missouri.
- Bannister, N., Arbaugh, F., & Simpson, A. (2016). Pressing methodological boundaries: Analyzing PCK using frame alignment processes. In M. B. Wood, E. E. Turner, M. Civil, & J.A. Eli (Eds.), *Proceedings of the 38th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp.1620-1623). Tucson, AZ: The University of Arizona.
- Arbaugh, F., Lannin, J., Barker, D., & Jones, D. L. (2005). Curriculum-specific professional development: A phenomenographical study of teachers' perceptions. In G. M. Lloyd, S. Wilson, J. L. M. Wilkins, & S. L. Behm (Eds.), *Proceedings of the twenty-seventh annual meeting of the North American chapter of the International Group for the Psychology of Mathematics Education*. Blacksburg, VA: Virginia Tech.
- Arbaugh, F. (2005). Inservice teacher education: Investigating mathematics teachers' professional growth. In G. M. Lloyd, S. Wilson, J. L. M. Wilkins, & S. L. Behm (Eds.), *Proceedings of the twenty-seventh annual meeting of the North American chapter of the International Group for the Psychology of Mathematics Education*. Blacksburg, VA: Virginia Tech.
- Arbaugh, F., Brown, C. A., & McGraw, R. (2003). The messy work of professional development: The conversation continues. In N. A. Pateman et al. (Eds.), *Proceedings of the Twenty-seventh Conference of the International Group for the Psychology of Mathematics Education held jointly with the Twenty-fifth Conference of PME-NA* (Volume 1, p. 193). Honolulu: University of Hawaii.
- McGraw, R., Arbaugh, F., Lynch, K., & Brown, C. A. (2003). Mathematics teacher professional development as the development of communities of practice. In N. A. Pateman et al. (Eds.), *Proceedings of the Twenty-seventh Conference of the International Group for the Psychology of Mathematics Education held jointly with the Twenty-fifth Conference of PME-NA* (Volume 3, p. 269-276). Honolulu: University of Hawaii.

- Arbaugh, F., Brown, C. A., & McGraw, R. (2002). The messy work of professional development: The conversation continues. In D. S. Mewborn et al. (Eds.), *Proceedings of the twenty-fourth annual meeting of the North American chapter of the International Group for the Psychology of Mathematics Education* (p. 139). Columbus, OH: ERIC Clearinghouse for Mathematics, Science, and Environmental Education.
- Brown, C. A., McGraw, R., Koc, Y., Lynch, K., & Arbaugh, F. (2002). Lesson study in secondary mathematics. In D. S. Mewborn et al. (Eds.), *Proceedings of the twenty-fourth annual meeting of the North American chapter of the International Group for the Psychology of Mathematics Education* (p. 1427). Columbus, OH: ERIC Clearinghouse for Mathematics, Science, and Environmental Education.
- Brown, C., Arbaugh, F., Allen, A., & Koc, Y. (2000). Learning together: Teachers' use of common planning time. In M. L. Fernandez (Ed.), *Proceedings of the twenty-second annual meeting of the North American chapter of the International Group for the Psychology of Mathematics Education* (p. 620). Columbus, OH: ERIC Clearinghouse for Mathematics, Science, and Environmental Education.

## **On-Line Curricular Materials for Mathematics Teachers**

- Arbaugh, F., Galindo, E., & Hart, E. (2000). Teaching, learning, and communicating about fractions. The National Council of Teachers of Mathematics Illuminations Website [Online]. Available: <http://illuminations.nctm.org/reflections/3-5/Fractions/index.html>
- Arbaugh, F. & Galindo, E. (2000). Learning about area, perimeter, and fractions with and from peers. The National Council of Teachers of Mathematics Illuminations Website [Online]. Available: <http://illuminations.nctm.org/reflections/6-8/LearningWithPeers/index.html>

## **Reports**

- Arbaugh, F., Herbel-Eisenmann, B., Ramirez, N., Knuth, E., Kranendonk, H., & Quander, J. (2010). *Linking research and practice: The NCTM research agenda conference report*. Access online at: [www.nctm.org](http://www.nctm.org).
- Abell, S., Arbaugh, F., Ehlert, M., & Lannin, J. (2009). *Missouri Department of Higher Education Improving Teacher Quality Grants Cycle 6 external evaluation report*. Columbia, MO: Southwestern Bell Science Education Center, University of Missouri-Columbia.
- Abell, S., Arbaugh, F., Ehlert, M., Lannin, J., & Marra, R. (2008). *Missouri Department of Higher Education Improving Teacher Quality Grants Cycle 5 external evaluation report*. Columbia, MO: Southwestern Bell Science Education Center, University of Missouri-Columbia.
- Abell, S., Ehlert, M., Lannin, J., Marra, R., & Arbaugh, F. (2007). *Missouri Department of Higher Education Improving Teacher Quality Grants Cycle 4 external evaluation report*. Columbia, MO: Southwestern Bell Science Education Center, University of Missouri-Columbia.

Abell, S., Ehlert, M., Lannin, J., Marra, R., Cole, J., & Arbaugh, F. (2006). *Missouri Department of Higher Education Improving Teacher Quality Grants Cycle 3 external evaluation report*. Columbia, MO: Southwestern Bell Science Education Center, University of Missouri-Columbia.

## Refereed Conference Presentations

### *International/National Refereed Presentations*

Feeburn, B., Graysay, D., Arbaugh, F., Konuk, N., Van Zoest, L. R. Stockero, S., Baldinger, E. E., & Campbell, M. (2022, February). Designing and implementing rehearsals in mathematics teacher education. Symposium at the 26<sup>th</sup> Annual Conference of the Association of Mathematics Teacher Educators, Las Vegas, NV.

Arbaugh, F., Graysay, D., Freeburn, B., & Konuk, N. (2021, November). Opportunities to learn in cycles of enactment and investigation. Forty-Third Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. *Productive Struggle: Persevering through Challenges*. Philadelphia, PA.

Graysay, D., Freeburn, B., Arbaugh, F., & Konuk, N. (2021, November). Prospective secondary mathematics teacher responses and the structure of approximations of practice. *Forty-Third Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Productive Struggle: Persevering through Challenges*. Philadelphia, PA.

Bieda, K., Luczak, R., Orr, S., Arbaugh, F. & Cirillo, M. (2021, April). Understanding preservice teachers' (PSTs') attention to disciplinary and interpersonal obligations while navigating classroom dilemmas in early field placements. Paper presented in symposium session at the *2021 Annual Meeting of the American Education Research Association*, virtual presentation.

Ortiz, N., Bieda, K., Cirillo, M. & Arbaugh, F. (2021, April). Preservice teachers and the obligations of mathematics teaching: Exploring a promising model of teacher education. Paper presented in symposium session at the *2021 Annual Meeting of the American Education Research Association*, virtual presentation.

Arbaugh, F., Cirillo, M., Do, S., & Bieda, K. (2021, February). The UTE Model for early field experiences: Perspectives of multiple stakeholders. Presented at the *Virtual 2021 Annual Meeting of the Association of Mathematics Teacher Education (AMTE)*, February 19, 2021.

Bieda, K., Luczak, R., Orr, S., Arbaugh, F. & Cirillo, M. (2021, February). Understanding PSTs' attention to the disciplinary and interpersonal obligations while navigating classroom dilemmas in early field placements. Presentation in Division K symposium session for the *2021 American Educational Research Association virtual conference*.

- Ortiz, N., Bieda, K., Cirillo, M. & Arbaugh, F. (2021, April). Pre-service teachers and the obligations of mathematics teaching: Exploring a promising model of teacher education. Presentation in Division K symposium session for the 2021 American Educational Research Association virtual conference.
- Bieda, K., Cirillo, M., Arbaugh, F., Voogt, K., Gregg, J., & Orr, S. (2020). The university teaching experience: Cross-Institutional partnership to develop a new model of early field experience. Session presented at the *2020 Michigan Association for Mathematics Teacher Educators Conversations among Colleagues Virtual Conference*, Ann Arbor, MI.
- Arbaugh, F., Cirillo, M., Bieda, K., LaRochelle, R., & Do, S. (2020, February). *Real-time coaching during secondary PSTs' teaching episodes: The practices of mathematics teacher educators*. Association of Mathematics Teacher Educators Annual Conference. Phoenix, AZ.
- Arbaugh, F., Freeburn, B., Konuk, N., & Graysay, D. (February, 2018). Secondary pre-service teachers' opportunities to learn in cycles of enactment and investigation (CEIs). Association of Mathematics Teacher Educators (AMTE) Annual Conference. Houston, TX.
- Arbaugh, F., Freeburn, B., Konuk, N., & Graysay, D. (April, 2018). Opportunities to learn in cycles of enactment and investigation. Poster presentation at the Annual Research Conference of the National Council of Teachers of Mathematics. Washington, DC.
- Arbaugh, F., Freeburn, B., Konuk, N., Graysay, D. (April, 2016). Unintended (but good!) outcomes: Impacting PSTs' vision of role of teacher. Annual Research Conference of the National Council of Teachers of Mathematics. San Francisco, CA.
- Bannister, N., Arbaugh, F., Simpson, A. (April, 2016). Analyzing mathematics teacher learning using frame alignment processes. Annual Research Conference of the National Council of Teachers of Mathematics. San Francisco, CA.
- Arbaugh, F., Graysay, D., Freeburn, B., Konuk, N. (January, 2016). Using rehearsals with secondary preservice mathematics teachers. Association of Mathematics Teacher Educators (AMTE) Annual Conference. Irvine, CA.
- Appova, A., & Arbaugh, F. (2015, April). Teachers' motivation to learn. Annual Research Conference of the National Council of Teachers of Mathematics. Boston, MA.
- Arbaugh, F., Freeburn, B., Graysay, D., & Konuk, N. (2015, February). Engaging teachers in analyzing core practices of mathematics teaching. Association of Mathematics Teacher Educators (AMTE) Annual Conference. Orlando, FL.
- Freeburn, B., Arbaugh, F., Karunakaran, S., & Konuk, N. (2014, April). Improving preservice mathematics teachers' generic example proof capability. National Council of Teachers of Mathematics Research Conference. New Orleans, LA.
- Arbaugh, F., Breyfogle, L., Langrall, C., Lloyd, G. M., & Smith, M. S. (2013, January). Publishing research in mathematics education for diverse audiences. Association of Mathematics Teacher Educators (AMTE) Annual Conference. Orlando, FL.

- Smith, M. S., Arbaugh, F. (2013, January). What teachers need to know and be able to do to engage students in reasoning-and-proving. Association of Mathematics Teacher Educators (AMTE) Annual Conference. Orlando, FL.
- Smith, M.S., Arbaugh, F., Steele, M., Boyle, J., Konuk, N., & Gordon, E. (2012, April). Developing Teachers' Capacity to Support Students' Reasoning and Proving. Research Pre-session of the Annual Meeting of the National Council of Teachers of Mathematics. Philadelphia, PA.
- Lannin, J., Chval, K.B., Arbaugh, F., Langrall, C., Taylor, C., Webb, M., Hicks, S., Bruton, R. (2012, April). Investigating secondary mathematics teacher PCK across the professional continuum. Research Pre-session of the Annual Meeting of the National Council of Teachers of Mathematics. Philadelphia, PA.
- Arbaugh, F., Taylor, C., Bruton, R., Chval, K.B., Webb, M. (2012, April). Examining expert secondary mathematics teachers' thinking about mathematics instruction. Annual Meeting of the American Educational Research Association. Vancouver, BC.
- Arbaugh, F., & Smith, M. S. (2012, February). Developing teachers' pedagogical practices for reasoning-and- proving: Learning to modify textbook tasks. Association of Mathematics Teacher Educators (AMTE) Annual Conference. Fort Worth, TX.
- Arbaugh, F., Asturias, H., Cuoco, A., Mill, V. (2011, April). Research opportunities arising from the standards for mathematical practice. Research Pre-session of the Annual Meeting of the National Council of Teachers of Mathematics. Indianapolis, IN.
- Steele, M., Arbaugh, F., & Boyle, J. (2011, April). Enhancing the reasoning-and-proving content of textbook tasks: A site for teacher professional development. Annual Meeting of the National Council of Supervisors of Mathematics. Indianapolis, IN.
- McCloskey, A., Arbaugh, F., Lloyd, G. (2011, January). Student teachers and their mentors in mathematics teacher education: Preliminary findings from a research study. Association of Mathematics Teacher Educators (AMTE) Annual Conference. Irvine, CA.
- Arbaugh, F., Marra, R., Abell, S., Lannin, J. K., Cheng, Y., Gagnon, M., Merle, D., & Smith, R. (2010, May). The impact of evaluation on professional development design and implementation. Annual Meeting of the American Educational Research Association. Denver, CO.
- Arbaugh, F., Herbel-Eisenmann, B., Knuth, E., Kranendonk, H., & Ramirez, N. (2010, April). NCTM research agenda conference report. Research Pre-session of the Annual Meeting of the National Council of Teachers of Mathematics. San Diego, CA.
- Arbaugh, F., Lannin, J. K., Chval, K. (2010, April). Delineating the PCK of beginning secondary mathematics teachers. Research Pre-session of the Annual Meeting of the National Council of Teachers of Mathematics. San Diego, CA.
- Lloyd, G., Bannister, V., Arbaugh, F., Herbel-Eisenmann, B., Drake, C., & Land, T. J. (2010, January). K-12 textbooks and curriculum materials as tools in mathematics teacher education. Association of Mathematics Teacher Educators Annual Conference, Irvine, CA.

- Masingila, J., Chazan, D., Dollard, C. D., & Arbaugh, F., (2010, January). Framings for secondary mathematics teacher education programs. Association of Mathematics Teacher Educators Annual Conference, Irvine, CA.
- Arbaugh, F., Quander, J., Barnes, D., & Findell, B. (2009, April). NCTM research agenda conference: Where do we go from here? Annual Meeting of the National Council of Teachers of Mathematics (NCTM), Washington, DC.
- Quander, J., & Arbaugh, F. (2009, April). Collaborating to identify research priorities in math education. Research Pre-session of the Annual Meeting of the National Council of Teachers of Mathematics (NCTM), Washington, DC.
- Smith, M. S., & Arbaugh, F. (2009, April). Developing teachers' capacity to engage students in reasoning and proving activities. Annual Meeting of the National Council of Supervisors of Mathematics. Washington, DC.
- Boone, W. J., Abell, S. K., Volkmann, M. J., Arbaugh, F., & Lannin, J. (2009, April). The development and utilization of a standards-based instrument to evaluate the perceived preparedness of science and mathematics teachers in an alternative certification program. National Association for Research in Science Teaching, Garden Grove, CA.
- Arbaugh, F., Chval, K., Jackson, C., Webb, M., & Regis, T. (2009, April). The growth of mathematics teachers' knowledge related to instruction. Annual Conference of the American Educational Research Association, San Diego, CA.
- Marra, R. M., Arbaugh, F., Lannin, J., Abell, S., Ehlert, M., Smith, R., Merle, D., & Park Rogers, M. (2009, April). Orientations to professional development design and implementation: Understanding their relationship to PD outcomes across multiple projects. Annual Conference of the American Educational Research Association, San Diego, CA.
- Arbaugh, F., Smith, M. S., Steele, M., & Taylor, C. (2009, February). Cases of reasoning and proving (CORP): Materials for secondary mathematics teacher education. Association of Mathematics Teacher Educators Annual Meeting, Orlando, FL.
- Chval, K.B., Arbaugh, F., & Lannin, J.K (2009, February). The dilemma of the launch: Why is it so difficult for mathematics teachers? Association of Mathematics Teacher Educators, Orlando, FL.
- Lannin, J. K., Abell, S., Arbaugh, F., Chval, K., Friedrichsen, P., & Volkmann, M. J. (2008, March). Researching teacher knowledge: Further delineating the PCK construct for science and mathematics education. American Educational Research Association Annual Meeting, New York, NY.
- Barker, D. D., Lannin, J. K., Townsend, B. E., Martin, T. S., & Arbaugh, F. (2008, March). Teachers' knowledge of algebraic generalization: Its organization for instruction. American Educational Research Association Annual Meeting, New York, NY.

- Park Rogers, M., Abell, S., Arbaugh, F., Cole, J., Hutchins, K. & Marra, R. (2008, March). Multiple approaches to science teacher professional development: What are they and how do teachers respond? American Educational Research Association Annual Meeting, New York, NY.
- Chval, K. B., Lannin, J. K., & Arbaugh, F., (2008, January). The PCK of beginning mathematics teacher educators. Association of Mathematics Teachers Educators Annual Meeting, Tulsa, OK.
- Arbaugh, F., Lannin, J. K., Chval, K., Regis, T., Pomerence, S., & Appova, A. (2007, March). Using lesson planning and video analysis as data collection tools for assessing PCK. Research Pre-session of the Annual Meeting of the National Council of Teachers of Mathematics, Atlanta, GA.
- Lannin, J. K., Chval, K., Arbaugh, F., Appova, A., Nivens, R., Olson, T., Pomerence, S., & Regis, T. (2007, January). Studying alternative certification in mathematics: A tale of two research projects. Association for Mathematics Teachers Educators Annual Meeting, Irvine, CA.
- Arbaugh, F., & Appova, A., (2007, January). Examining the role of the university mathematics teacher educator. Association for Mathematics Teachers Educators Annual Meeting, Irvine, CA.
- Arbaugh, F., Abell, S., Lannin, J., Volkmann, M., & Boone, W. (2006, April). Investigating alternative certification internship models in mathematics and science teacher education. American Educational Research Association Annual Meeting, San Francisco, CA.
- Arbaugh, F., Lannin, J., Jones, D. L., & Barker, D. (2006, January). Using pedagogical thinking as a lens to study teacher change. Association for Mathematics Teachers Educators Annual Meeting, Tampa, FL.
- Lambdin, D. V., Morge, S., & Arbaugh, F. (2006, January). What can teachers learn from the National Assessment of Educational Progress (NAEP)? Association for Mathematics Teachers Educators Annual Meeting, Tampa, FL.
- Boone, W., Abell, S., Volkmann, M., Arbaugh, F., & Lannin, J. (2006, January). Perceived preparedness of science and mathematics teachers in an alternative certification program: Implications for faculty and students. The Annual Meeting of the Association for Science Teacher Education, Portland, OR.
- Arbaugh, F. (2005, October). Inservice teacher education: Investigating mathematics' teachers professional growth. The Annual Meeting of the North American Chapter of Psychology of Mathematics Education. Roanoke, VA.
- Arbaugh, F., Lannin, J., Jones, D. L., & Barker, D. (2005, October). Curriculum-specific professional development: A phenomenographical study of teachers' perceptions. The Annual Meeting of the North American Chapter of Psychology of Mathematics Education. Roanoke, VA.



- Friedrichsen, P., Lannin, J., Arbaugh, F., Volkmann, M., & Abell, S. (2005, April). Professional identities: Implications for alternative certification programs in mathematics and science. American Educational Research Association Annual Meeting, Montreal.
- Volkmann, M., Arbaugh, F., Scribner, J., Friedrichsen, P., Lannin, J., & Abell, S. (2005, April). Defining highly qualified teachers among teacher certification students: A real Paige turner. American Educational Research Association Annual Meeting, Montreal.
- Abell, S., Arbaugh, F., Boone, W., Volkmann, M., & Lannin, J. (2005, January). Field-based internship models for alternative certification: Views of interns, mentors, and university science educators. Association for the Education of Teachers of Science Annual Meeting, Colorado Springs, CO.
- Lannin, J., Arbaugh, F., Jones, D., & Rogers, M. (2005, January). Differentiating instructional practices in *Core-Plus* classrooms. Association for Mathematics Teachers Educators Annual Meeting, Dallas, TX.
- Arbaugh, F., Lambdin, D., Lynch, K., & Morge, S. (2005, January). NAEP Professional development materials. Association for Mathematics Teachers Educators Annual Meeting, Dallas, TX.
- McGraw, R., Arbaugh, F., Lynch, K., & VanZoest, L. (2004, April). Studying teacher development through the theoretical lenses of community and identity. Research Pre-session of the Annual Meeting of the National Council of Teachers of Mathematics, Philadelphia, PA.
- Abell, S., Boone, W., Beilfuss, M., Volkmann, M., Demir, A., Arbaugh, F., & Lannin, J. (2004, January). Recruiting future science and mathematics teachers in alternative certification programs: Strategies tried and lessons learned. Association for the Education of Teachers in Science Annual Meeting, Nashville, TN.
- Lannin, J., Arbaugh, F., Abell, S., Volkmann, M., & Boone, W. (2004, January). Meeting the challenges: Designing and implementing a post-baccalaureate program for mathematics and science teachers. Association of Mathematics Teacher Educators Annual Meeting, San Diego, CA.
- McGraw, R., Arbaugh, F., Lynch, K., & Brown, C. A. (2003, July). Mathematics teacher professional development as the development of communities of practice. Twenty-seventh Conference of the International Group for the Psychology of Mathematics Education held jointly with the Twenty-fifth Conference of PME-NA Honolulu, HI.
- Arbaugh, F., Brown, C. A., & McGraw, R. (2003, July). The messy work of professional development: The conversation continues. Twenty-seventh Conference of the International Group for the Psychology of Mathematics Education held jointly with the Twenty-fifth Conference of PME-NA Honolulu, HI.
- Reys, B., & Arbaugh, F. (2003, April). Middle school mathematics texts: What's all the fuss? National Council of Teachers of Mathematics Annual Meeting, San Antonio, TX.

- Abell, S., Volkmann, M., Arbaugh, F., Lannin, J., Boone, B. (2003, February). Designing a post-baccalaureate program for the recruitment and retention of science and mathematics teachers. Association for the Education of Teachers of Science annual meeting, St. Louis, MO.
- Arbaugh, F., Brown, C. A., & McGraw, R. (2002, October). The messy work of professional development: The conversation continues. Discussion session at the Twenty-fourth annual meeting of the North American chapter of the International Group for the Psychology of Mathematics Education (PME-NA), Athens, GA.
- Brown, C. A., McGraw, R., Koc, Y., Lynch, K., & Arbaugh, F. (2002, October). Lesson study in secondary mathematics. Paper presentation at the Twenty-fourth annual meeting of the North American chapter of the International Group for the Psychology of Mathematics Education, Athens, GA.
- Arbaugh, F., & Brown, C. A. (2002, April). Influences of the Mathematics Tasks Framework on high school mathematics teachers' knowledge, thinking, and teaching. Paper presented at the American Educational Research Association Annual Meeting, New Orleans, LA.
- Arbaugh, F., & Bay-Williams, J. (2002, January). Designing mathematics methods courses using *Principles and Standards for School Mathematics* as a primary text. The Association of Mathematics Teacher Educators Sixth Annual Conference, San Antonio, TX.
- Brown, C. A., Arbaugh, F., Allen, A., & Koc, Y. (2001, April). Mathematics teachers' use of common planning time. American Educational Research Association Annual Meeting, Seattle, WA.
- Brown, C. A., Arbaugh, F., Lutz, M., & McGraw, R. (2001, April). Studying professional development is messy work. What are the research issues? Research Pre-session of the National Council of Teachers of Mathematics Annual Meeting, Orlando, FL.
- Smith, M., Stein, M. K., Arbaugh, F., Henningsen, M., McGraw, R., Wilson, M., & Zawojewski, J. (2000, February). Cases in mathematics teacher education: What do teachers learn from these experiences? Association of Mathematics Teacher Educators Annual Conference, Charlotte, NC.
- McGraw, R., & Arbaugh, F. (2000, April). Problem solving with the Geometer's Sketchpad. National Council of Teachers of Mathematics Annual Meeting, Chicago, IL.
- Arbaugh, F. & Beckner, E. (1999, April). You (and your students) can do it! Algebraic thinking activities for your K- 5 classroom. National Council of Teachers of Mathematics Annual Meeting, San Francisco, CA.

### ***Regional and State Refereed Presentations***

- Arbaugh, F., Cirillo, M., & Bieda, K. (2019). Learning about ambitious teaching: An on-campus early field experience model for secondary mathematics PSTs. Presentation at the Annual Symposium of the Pennsylvania Association of Mathematics Teachers Educators (PAMTE). Shippensburg, PA.

- Arbaugh, F. (2018). Getting your secondary PSTs to *that* realization. Presentation at the Annual Symposium of the Pennsylvania Association of Mathematics Teachers Educators (PAMTE). Shippensburg, PA.
- Arbaugh, F. (2017). An example of an implemented cycle of enactment and investigation (CEI). Presentation at the Annual Symposium of the Pennsylvania Association of Mathematics Teachers Educators (PAMTE). Shippensburg, PA.
- Arbaugh, F. (2012, May). Focus on reasoning-and-proving with secondary pre-service mathematics teachers. Presentation at the Annual Symposium of the Pennsylvania Association of Mathematics Teachers Educators (PAMTE). Shippensburg, PA.
- Arbaugh, F. (2008, December). Principles of effective instruction. Presentation at the annual Missouri Council of Teachers of Mathematics Conference, Columbia, MO.
- Lannin, J.K., & Arbaugh, F. (2005, December). Transitioning to teaching: Perspectives of first-year elementary, middle, and secondary teachers. Presentation at the annual Missouri Council of Teachers of Mathematics Conference, Columbia, MO.
- Arbaugh, F., & Jones, D. L. (2003, December). Rewriting test questions: Strategies for making math tests more meaningful. Annual meeting of the Missouri Council of Teachers of Mathematics. Columbia, MO.
- Arbaugh, F., & Bay-Williams, J. (2003, May). Exploring standards-based middle school curricula through the algebra strand. 2003 Green Lakes Conference sponsored by the Wisconsin Mathematics Council, Green Lakes, WI.
- Arbaugh, F. et al. (2002, December). Bungie Barbie and kamakazi Ken: A data collection and analysis activity. Annual meeting of the Missouri Council of Teachers of Mathematics, Columbia, MO.

## **Invited Presentations**

### ***National Invited Presentations***

- Arbaugh, F. (2017). What does linking research and practice really mean? Association of Mathematics Teacher Educators (AMTE) Annual Conference. Orlando, FL.
- Arbaugh, F., Asempapa, R., & Vavasseur, C. (2015, December). Preparing teacher candidates for the common core state standards in mathematics: The sequel. Webinar sponsored by the American Association of Colleges for Teacher Education (AACTE).
- Arbaugh, F. (2014, April). Three principles of effective mathematics instruction. National Council of Teachers of Mathematics (NCTM) Annual Meeting. New Orleans, LA.
- Arbaugh, F. (2014, April). Supporting teachers to enact three principles of effective mathematics instruction. National Council of Supervisors of Mathematics (NCSM) Annual Meeting. New Orleans, LA.

- Arbaugh, F., (2013, April). Get your students to reason more in math class. Kickoff Session Speaker, Learn/Reflect Strand, National Council of Teachers of Mathematics (NCTM) Annual Meeting. Denver, CO.
- Arbaugh, F., & Chval, K. B. (2013, April). Supporting the transition from experienced teacher to mathematics coach. National Council of Supervisors of Mathematics (NCSM) Annual Meeting. Denver, CO.
- Abell, S., Arbaugh, F., Chval, K., Friedrichsen, P., Lannin, J., & Volkmann, M. J. (2006, May). Research on alternative certification: Where do we go from here? STEM-ACT Conference on Alternative Certification of Science Teachers, Arlington, VA.
- Arbaugh, F., & Bay-Williams, J. (2003, January). Using standards-based curriculum materials in the preparation of teachers. The Pre-Conference of the Association of Mathematics Teacher Educators Seventh Annual Conference, Atlanta, GA.
- Arbaugh, F., & Bay-Williams, J. (2002, April). Fostering a successful implementation: Helpful strategies for supporting teachers and building community support. Show-Me Conference 2002, Atlanta, GA.
- Arbaugh, F. (2001, May). NCTM's *Principles and Standards for School Mathematics*: Messages for grades 6-8. Show-Me Conference 2001, St. Louis, MO.
- Brown, C., & Arbaugh, F. (2001, April). Lesson study in secondary mathematics: Professional development through lesson development. National Council of Supervisors of Mathematics Annual Meeting, Orlando, FL.
- Reys, B., & Arbaugh, F. (2001, April). Professional development alternatives for middle school mathematics teachers. National Council of Teachers of Mathematics Presidential Awardees' Annual Meeting, Orlando, FL.

### ***Regional and State Invited Presentation***

- Arbaugh (November, 2021). Fran's top 5 reasons to get your students reasoning more in math class. PAMTE Pre-Service Teacher Day, Millersburg University.
- Arbaugh (March, 2018). Reasoning-and-proving: Do you know it when you see it? Presentation at the North Carolina Council of Teachers of Mathematics Leadership Conference. High Point, NC.
- Arbaugh (2018, March). Reasoning-and-proving: A door to supporting productive struggle and posing purposeful questions. Workshop provided for the Sandhill Professional Development Project. Hamlet, NC.
- Arbaugh, F., (2016, June). Fran's Top 5: Get your students reasoning more in math class. Keynote presentation at the Best Practices Conference. PSU-Behrend. Erie, PA.
- Arbaugh, F., (2015, December). Mathematics methods courses as sites for scholarly inquiries. Michigan State University Mathematics Education Colloquium. Lansing, MI.

- Arbaugh, F. (2013, November). Think math!! Keynote presentation at the annual meeting of the Pennsylvania Council of Teachers of Mathematics (PCTM), Seven Springs Resort, PA.
- Arbaugh, F. (2013, September). Who *is* Responsible for Teacher Learning? Keynote presentation at the Texas Council of Teachers of Mathematics (AMTE-TX) Conference, Houston, TX.
- Arbaugh, F. (2013, May). Who's responsible for teacher learning? Keynote presentation at the annual symposium of the Pennsylvania Association of Mathematics Teacher Educators (PAMTE), Shippenburg, PA.
- Arbaugh, F. (2010, December). Fran's Top 5: Get your students reasoning more in math class. Keynote presentation at the Annual Conference of the Missouri Council of Teachers of Mathematics (MCTM), Columbia, MO.
- Arbaugh, F. (2010, May). Introducing AMTE's new journal: How can we become involved? Keynote presentation at the annual symposium of the Pennsylvania Association of Mathematics Teacher Educators (PAMTE), Shippenburg, PA.
- Arbaugh, F., & Bay-Williams, J. (2005, February). Assessment and problem solving go hand in hand. ACCLAIM Pre-service Conference. Morehead, KY.
- Arbaugh, F. (2004, September). Considering levels of cognitive demand: A framework for engaging preservice teachers in analyzing the relationship between types of mathematical tasks and student reasoning. Mathematics Teacher Preparation in Appalachia: Third Annual Conference. Huntington, WV.
- Arbaugh, F. (2003, February). Professional development and partnerships: Making it work. Keynote address at the 2003 Missouri Mathematics Leadership Conference. Lake Ozark, MO.
- Reys, B. & Arbaugh, F. (2003, January). Choosing middle school mathematics curricula: What are the issues? Parkway School District 6-8 Mathematics Teacher Workshop.
- Arbaugh, F., & Jones, D. L. (2002, August). The great divide: Issues to consider when choosing a middle school mathematics curriculum. Webster Groves School District 6-8 Math Selection Workshop.
- Arbaugh, F., & Bay-Williams, J. (2002, July). Fostering a successful implementation: Helpful strategies for supporting teachers and building community support. Annual Meeting of the Indiana Council of Teachers of Mathematics, Indianapolis, IN.
- Reys, B., & Arbaugh, F. (2002, July). Middle School Mathematics Reform: Where are we? Where do we need to go? How do we get there? Annual Meeting of the Indiana Council of Teachers of Mathematics, Indianapolis, IN.
- Arbaugh, F. (2002, June). Do textbooks matter? Northern Arizona University Curriculum Showcase. Flagstaff, AZ.
- Townsend, M., Monnier, N., Arbaugh, F., Iosevich, A. (2002, February). Developing WI courses. Teaching Renewal Conference, University of Missouri-Columbia.

Arbaugh, F., & Bay-Williams, J. (2002, January). NSF-sponsored middle-school mathematics curricula. Session sponsored by the Rhode Island Department of Education, Rhode Island College, Providence, RI.

Arbaugh, F. (2001, April). Standards-based middle school mathematics curriculum materials – What makes it work? (Breakout session). Missouri Mathematics Leadership Conference, Lake Ozark, MO.

## External and Internal Funding

### External

#### *Funded*

National Science Foundation. Collaborative Research: Early Field Experiences for Prospective STEM Teachers: Scaling the UTE Model. Collaborative Project with Michigan State University (Kristen Bieda) and University of Delaware (Michelle Cirillo). PSU PI: Fran Arbaugh. 8/15/17-7/30/2021. PSU Award: \$778,886

National Science Foundation through a subcontract from the University of Pittsburgh. Cases of Reasoning and Proof in Secondary Mathematics (CORP). PSU PI/Co-director: Fran Arbaugh. September 1, 2007-August 31, 2012. Total Subcontract Award = ~\$400,000.

National Science Foundation. Supporting Career Changers to Become Mathematics and Science Teachers in Missouri (Supplemental Request). PI: Sandra Abell. Co-PIs: Fran Arbaugh, Mark Volkmann. Total requested: \$98,866.

National Science Foundation. MU Noyce Scholars Program for Science and Mathematics Teachers. PI: Sandra Abell. Co-PIs: Fran Arbaugh, Oscar Chavez, Mark Volkmann, John Adams (Chemistry), Carol Wicks (Geological Sciences). Total requested: \$498,020.

Missouri Department of Higher Education. Evaluation of Cycles 4-8 Professional Development Projects. PI: Sandra Abell. Co-PIs: Fran Arbaugh, John Lannin, Rose Marra (SISLT), Mark Ehlert (Economics). August 2005-November 2011. \$190,000 per cycle, Total Award = \$950,000. ([www.pdeval.missouri.edu](http://www.pdeval.missouri.edu))

National Science Foundation. Researching Science and Mathematics Teacher Learning in Alternative Certification Models. PI: Sandra Abell. Co-PIs: Fran Arbaugh, Kathryn Chval, Pat Friedrichsen, John Lannin, Mark Volkmann. June 1, 2006 – May 31, 2011. Total Award = \$1,947,207.

National Science Foundation. Supporting Career Changers to Become Mathematics and Science Teachers. PI: Sandra Abell. Co-PIs: Fran Arbaugh, John Lannin, Mark Volkmann, Meera Chandrasekhar (Physics), Jan Weaver (Biology), Mary Laffey (Columbia Public Schools -- CPS). September 1, 2003 – August 31, 2007. Total Award = \$494,569.

National Science Foundation. Getting to the Core: Supporting Teachers' Implementation of *Contemporary Mathematics in Context*. PI: Fran Arbaugh. July 1, 2002 - June 30, 2004. No-cost extension year ended September 30, 2005. Total award = \$199,682.

National Science Foundation. Science and Mathematics Academy for the Recruitment and Retention of Teachers (SMAR<sup>2</sup>T). PI: Sandra Abell. Co-PIs: Fran Arbaugh, John Lannin, Mark Volkmann, Meera Chandrasekhar (Physics), Jan Weaver (Biology), Mary Laffey (CPS). June 1, 2002 – May 31, 2006. Total Award = \$872,690.

National Science Foundation. Show-Me Project II. PI: Barbara Reys. Co-PIs: Fran Arbaugh, Ira Papick (Math), Robert Reys. September 1, 2002- August 31, 2005. No cost extension approved through August 2007. Total Award = ~ \$5,100,000.

Missouri Coordinating Board for Higher Education. GEAR UP Missouri Professional Development II. PI: Fran Arbaugh. January 2002-December 2002. Total Award = \$8,715.

Missouri Coordinating Board for Higher Education. GEAR UP Missouri Professional Development I. PI: Fran Arbaugh. May 2001-December 2001. Total Award: \$8715.

National Science Foundation. Enhancing Leadership for Middle School Science (ELMSS). PI: Sandra Abell. External Evaluator: Fran Arbaugh. February 2002-May 2003. Total Award = \$199,815.

National Science Foundation. Show-Me Project. PI: Barbara Reys. Co-PIs: John Beem (Math), Ira Papick (Math), Robert Reys. Consultant: Fran Arbaugh. January 2001-August 2002. Total Award = \$6,000,000.

### *Not Funded*

National Science Foundation. Arbaugh, F. (PI), Andrew Baxter, Andrea McCloskey, James Yao (Co-PIs). "Investigating and Scaling an Integrated Professional Development Model for Elementary Teachers: The Problems-Based Mathematics Institute," Submitted November, 2018. Total requested: \$4,958,065

National Science Foundation. Institutional Change of Mathematics Instruction. Co-PI. Submitted January 11, 2016. Proposed grant timeline: July 2016-June 2021. Requested amount: \$2,997,667

National Science Foundation. MaSTER STEM: Math and Science Teachers Engaged in Researching Science and Mathematics Bridging Practices. Co-PI. Submitted December 7, 2015. Proposed grant timeline: August 2016-July 2020. Requested amount: \$2,451,093

National Science Foundation. Bridging the gap between teacher learning and effective classroom practices: A professional development model for enhancing reasoning-and-improving in secondary mathematics. PI: Fran Arbaugh. Co-PIs: Gwendolyn Lloyd, Andrea McCloskey, Scott McDonald, Margaret (Peg) Smith. Submitted December 6, 2012. Total Requested = \$2,857,774. Reviewed as "highly competitive" in 2013. Not funded.

National Science Foundation. Bridging the gap between teacher learning and effective classroom practices: A professional development model for enhancing reasoning-and-improving in secondary mathematics. PI: Fran Arbaugh. Co-PIs: Lynn Breyfogle, Gwendolyn Lloyd, Andrea McCloskey, Scott McDonald, Margaret (Peg) Smith. Submitted January 10, 2012. Total Requested = \$2,999,990. Reviewed as “highly competitive” in 2012. Not funded.

National Science Foundation. Improving Mathematics and Science Teaching and Learning Through Discourse: A Model of Professional Development for K-12 Mathematics and Science Mentors and Their Mentees. PI: Fran Arbaugh. Co-PIs: Bernard Badiali, Gwen Lloyd, Andrea McCloskey, Scott McDonald, Jim Nolan, Carla Zembal-Saul. Submitted January 6, 2011. Total Requested = \$3,465,276.

National Science Foundation. Supporting Undergraduate Mathematics Teacher Education through Preparing Future Faculty. PI: Kathryn Chval. Co-PIs: Fran Arbaugh, John Lannin. Total requested: ~\$150,000.

National Science Foundation through a subcontract from the University of Pittsburgh. Cases of Reasoning and Proof in Secondary Mathematics. Co-director: Margaret (Peg) Smith, University of Pittsburgh. Subcontract/MU PI: Fran Arbaugh. Total Award to MU = \$350,213. Reviewed as “competitive” in 2006. Not funded.

National Science Foundation. Assessment-Driven Professional Development: Supporting and Studying Mathematics Teachers’ Professional Growth. PI: Fran Arbaugh. Co-PIs: John Lannin, James Tarr, and Chip Sharp (CPS). Total Requested: \$2,287,669 for 5 years. Reviewed as “high priority” in 2005. Not funded.

National Science Foundation. Partners for Enhancing Teaching and Learning of Mathematics. PI: Fran Arbaugh. Co-PIs: John Lannin, Linda Coutts (CPS), Dennis Sentille (Math), Chip Sharp (CPS), Debra Perkowski (Westminster College). Total amount requested: \$6,503,683 for 5 years. Reviewed as “competitive” in 2002. Not funded.

## **Internal**

### *Funded*

PSU College of Education RIG. Student Teachers and Their Mentors in the Practices of Mathematics Teacher Education. PI: Andrea McCloskey. Co-PIs: Fran Arbaugh and Gwen Lloyd. Total Award: RIG \$17,541; C&I: \$14,137; Arbaugh Start-up Funds: \$3,000. Awarded January 2010. Project dates: August 2010-May 2011.

### *Not funded*

UM Research Board. Implementation Leadership for *Connected Mathematics Project*. PI: Fran Arbaugh. Co-PI: Brendan Maxcy (ELPA). Total Award = \$44,671. Submitted February 1, 2006. Not funded.



MU Research Council. Establishing Institutional Competence: A Study of Leadership Practices Enabling the Implementation of the Connected Mathematics Project. PI: Fran Arbaugh. Co-PI: Brendan Maxcy (ELPA). Total Award = \$7,396. Submitted February 13, 2006. Not funded.

## Editorial and Review Work

### *Editorships*

Co-Editor. *Journal of Teacher Education*. Association of American Colleges of Teacher Education (AACTE). August 2010-2015.

Editorial Panel Member. *Cases in Mathematics Teacher Education: Tools for Developing Knowledge Needed for Teaching*. Association of Mathematics Teacher Educators (AMTE) Monograph Series, Volume 4. January 2006-February 2008.

Editorial Panel Member. *The Work of Mathematics Teacher Educators: Exchanging Ideas for Effective Practice*. Association of Mathematics Teacher Educators (AMTE) Monograph Series, Volume 3. January 2005-September 2007.

Co-Editor. “Supporting Teacher Learning” Department, *Teaching Children Mathematics*. Fall 2004-Fall 2006.

### *Additional Review Work*

Manuscript Reviewer. *Mathematics Teacher Educator (MTE)*. August 2013 – present.

Manuscript Reviewer. *Journal of Mathematics Teacher Education (JMTE)*. July 2003-present.

Manuscript Reviewer. *Journal for Research in Mathematics Education (JRME)*. April 2003 – present.

Manuscript Reviewer. *Mathematics Teacher (MT)*. Fall 2001-present.

NCTM Research Pre-session Proposal Reviewer. Fall 2010.

Research Presentation Proposal Reviewer. American Educational Research Association: Division K. September 2005.

Book Revision Reviewer. Reviewed [McNamara, T. J. (2003). *Key concepts in mathematics: Strengthening standard practice in grades 6-12*. Glenview, IL: Pearson Publishing.] and supplied extensive revision suggestions. August 2005.

Research Presentation Proposal Reviewer. Psychology of Mathematics Education – North American Chapter 2002 Annual Meeting.

Research Presentation Proposal Reviewer. SIG/RME sessions for American Educational Research Association Annual Meeting. August 2001, 2012

Journal Evaluator. *Mathematics Teaching in the Middle School*. February 2002 issue.

Manuscript Reviewer. Reviewed the pre-publication copy of: Danielson, C., & Marquez, E. (1998). *A collection of performance tasks and rubrics: High school mathematics*. Larchmont, NY: Eye on Education, Inc. (Summer 1997).

## **Professional Service**

Immediate Past-President, Association of Mathematics Teacher Educators (AMTE), February 2015-January 2016.

President, Association of Mathematics Teacher Educators (AMTE), February 2013-February 2015.

President-Elect, Association of Mathematics Teacher Educators (AMTE), February 2012-February 2013.

External Evaluator: *RtI in Mathematics: Collaborating to Make a Difference*. An NSF funded project to the Council for Exceptional Children (CEC) and the National Council for Teachers of Mathematics (NCTM).

Advisory Committee Member for “Mathlanding: Resources and Tools for Elementary Math Specialists and Teachers.” Maryland Public Television. Summer 2011-present.

Member of the *Common Core State Standards – Mathematics Task Force*, Association of Mathematics Teacher Educators (AMTE). August 2011-present.

2015 – 2 Promotion and Tenure External Review Letters

2012 – 1 Promotion and Tenure External Review Letters

2011 – 5 Promotion and Tenure External Review Letters

2010 – 3 Promotion and Tenure External Review Letters

Member of the Board of Directors. Association of Mathematics Teacher Educators (AMTE). January 2007-January 2010.

Facilitator of the Columbia Public Schools Secondary Mathematics Taskforce. September 2006-May 2007.

Judge for the Missouri submissions for the Presidential Awards for Excellence in Mathematics and Science Teaching, June 2006.

Reviewed materials of, and wrote a letter of support for, Dr. Angela Walmsey, St. Louis University. Summer 2005.

Member of the Advisory Board for the 2006 Missouri Preservice Mathematics Teacher Conference. September 2005-April 2006.

Member of the Program Committee for the 2005 Annual Meeting of the Association of Mathematics Teacher Educators (AMTE).

Member of the Local Advisory Board for the Center for the Study of Mathematics Curriculum (CSMC). June 2004-May 2007.

Membership Committee. Association of Mathematics Teacher Educators (AMTE). February 2002-January 2006.

Missouri 7th and 8th Grade Mathematics Contest Judge. Hickman High School. April 2001.

Assistant Curriculum Developer -- National Council of Teachers of Mathematics Standards 2000 Web Development Team. June 1999 - April 2000.

Problem Developer. Developed and contributed problems for the October 1999 Mathematics Teacher monthly calendar of daily mathematics problems for high school teachers.  
Assistant External Evaluator: Indiana Mathematics Initiative (IMI). Fall 1997 - Spring 1999.

## **University Service**

### **Penn State University**

#### *PSU Campus*

University Marshall. May 2015-present.

College of Education Representative, Freshman Convocation, August 25, 2012.

Schreyer's Honors College Faculty Advisory Board (2018-2020)

#### *PSU College of Education*

Faculty Associate, Penn State Education House. January 2015-present.

Promotion and Tenure Committee Member. August 2011-August 2014.

Member of Mathematics Education Faculty Search Committee, Penn State Erie, The Behrend College, Fall 2011

Member of Faculty PI Interview Team. Director of Contracts Search. Fall 2010

Peer Evaluation of Teaching: Deidre O'Sullivan (2011)

#### *PSU Department of Curriculum & Instruction*

Acting Department Head. September-December 2021.

Associate Department Head. July-August 2021; January 2022-present.

Middle Level Education Coordinator. Fall 2015-Spring 2016.

Awards and Scholarship Committee Member. August 2015-May 2016.

Director of Secondary Education Program. July 2011-October 2013.

Promotion and Tenure Committee Member. August 2010-August 2011. August 2020-May 2021.

Department Representative to COE Faculty Council. August 2010-August 2013; August 2015-August 2017.

## **Organizational Memberships**

Association of Mathematics Teacher Educators (AMTE)

National Council of Teachers of Mathematics (NCTM)

Pennsylvania Association of Mathematics Teacher Educators (PAMTE)