Laine Percell Bradshaw

The University of Georgia
Associate Professor with tenure
Quantitative Methodology, College of Education
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Education

Ph.D. in Research, Evaluation, Measurement and Statistics
The University of Georgia, 2011

M.Ed. in Mathematics Education
The University of Georgia, 2007

B.S. in Mathematics Education
The University of Georgia, 2007
 Graduated Summa Cum Laude
 Graduated with Honors

Academic Positions

The University of Georgia August 2016 – present
Associate Professor with tenure, Department of Educational Psychology

The University of Georgia July 2012 – July 2016
Assistant Professor (tenure track), Department of Educational Psychology

James Madison University July 2011 – June 2012
Assistant Professor (tenure track), Department of Graduate Psychology
Assistant Assessment Specialist, Center for Assessment and Research Services

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Peer-reviewed Journal Articles

*Indicates collaboration with a student during their graduate studies.
**Indicates equal contribution from authors.

*Bao, Y., *Shen, Y., Wang, S., & **Bradshaw, L.** (2020) Flexible Computerized Adaptive Tests to Detect Misconceptions and Estimate Ability Simultaneously. *Applied Psychological Measurement*, DOI: 10.1177/0146621620965730.

*Xue, K., & **Bradshaw, L.** (2020) A Semi-supervised learning-based Diagnostic Classification Method Using Artificial Neural Networks. *Frontiers in Psychology*. DOI: 10.3389/fpsyg.2020.618336

Bradshaw, L., & Levy, R. (2019) Interpreting probabilistic classifications from diagnostic psychometric models. *Educational Measurement: Issues and Practice*, 38 (2), 79-88.

Izsák, A., Jacobson, E., & **Bradshaw, L.** (2019). Surveying Middle Grades Teachers' Reasoning About Fraction Arithmetic in Terms of Measured Quantities. *Journal of Research in Mathematics Education*, 50(2), 156-209.

*Madison, M., & **Bradshaw, L.** (2018). Assessing Growth in a Diagnostic Classification Model Framework. *Psychometrika*, 83(4), 963-990.

*Bao, Y., & **Bradshaw, L.** (2018). An Attribute-level Item Selection Method for DCM-CAT. *Measurement: Interdisciplinary Research and Perspectives,* 16(4), 209-255.

*Madison, M., & **Bradshaw, L.** (2018). Evaluating Intervention Effects in a Diagnostic Classification Model Framework. *Journal of Educational Measurement*, 55(1), 32-51.

Harrison, A., **Bradshaw, L.**, Naqvi, N., Campbell, J., & Paff, M. (2017). Development and Psychometric Evaluation of the Autism Stigma and Knowledge Questionnaire (ASK-Q). *Journal of Autism and Development Disorders*, 47(10), 3281-3295.

*Sen, S. & **Bradshaw, L.** (2017). Comparison of relative fit indices for diagnostic model selection. *Applied Psychological Measurement*, 41(6), 422-438.

*Bradshaw, L. & Madison, M. (2016). Invariance Principles for General Diagnostic Models. *International Journal of Testing*, 16(2), 99-118.

*Liu, R., Huggins-Manley, A.C., **Bradshaw, L.** (2016). The impact of Q-matrix designs on diagnostic classification accuracy in the presence of attribute hierarchies. *Educational and Psychological Measurement*, 77(2), 420-440.

Templin, J., **Bradshaw, L.**, & Paek, P. (2016). A comprehensive framework for integrating innovated psychometric methodology into educational research. In A. Izsák, J. Remillard, & J. Templin (Eds.), *Psychometric methods in mathematics education: Opportunities, challenges, and interdisciplinary collaborations* (pp. 97-117). Journal of Research in Mathematics Education Monograph Series No. 15. Reston, VA: National Council of Teachers of Mathematics.

*Madison, M., & **Bradshaw, L.** (2015). The effects of Q-matrix design on classification accuracy in the log-linear cognitive diagnosis model *Educational and Psychological Measurement, 75* (3), 491-511.

Bradshaw, L., Izsák, A., Templin, J., & Jacobson, E. (2014). Diagnosing teachers' understandings of rational number: Building a multidimensional test within the diagnostic classification model framework. *Educational Measurement: Issues and Practice, 33*(1), 2-14.

Bradshaw, L., & Templin, J. (2014). Combining scaling and classification: A psychometric model for scaling ability and diagnosing misconceptions. *Psychometrika*, *79* (3), 403-425.

*Jurich, D., & **Bradshaw, L.** (2014). Diagnosing psychosocial research attributes: An illustration of diagnostic classification modeling. *International Journal of Testing, 14,* 49-72.

Templin, J., & **Bradshaw, L.** (2014). Hierarchical diagnostic classification models: A family of models for estimating and testing attribute hierarchies. *Psychometrika, 79*(2) 317-339.

Templin, J., & **Bradshaw, L. (2014). The use and misuse of psychometric models. *Psychometrika, 79*(2) 347-354.

Templin, J., & **Bradshaw, L.** (2013). Measuring the reliability of diagnostic classification model examinee estimates. *Journal of Classification*, *30*(2), 251-275.

Book Chapters/Other Publications

Lee, H. S., Famularo, L., Masters, J., **Bradshaw, L.**, & Sanei, H. R. (2019). Students' reasoning about probability in the context of a raffle. In J. M. Contreras, M. M. Gea, M. M. López-Martín y E. Molina-Portillo (Eds.), Actas del Tercer Congreso International Virtual de Educación Estadística. Available at www.ugr.es/local/fqm126/civeest.html

Bradshaw, L. (2018) Diagnostic classification models. In Frey, B. (Ed.), *The SAGE Encyclopedia of Educational Research, Measurement, and Evaluation,* 507-512.

Bradshaw, L. (2018). Diagnostic classification models. In D. Bandalos (Ed.), *Measurement Theory and Application for the Social Sciences.* New York, NY: Guilford Press, 446-477.

Bradshaw, L. (2016). Diagnostic Classification Models: A Multivariate Classification Approach for Cognitively Complex Assessment. In A. Rupp, & J. Leighton (Eds.), *Handbook of Cognition and Assessment*. Wiley-Blackwell, 297-326.

Other Creative Research Products

*Indicates collaboration with a graduate student.

Bradshaw. L., & Hollingsworth, W. (2013). DigiTAP: A software system for digitially-capturing think-aloud protocols (Version 1.0) [Computer software]. Athens, GA: Hollingsworth Technologies, Incorporated and Metricology, LLC.

*Madison, M., **Bradshaw. L.**, & Hollingsworth, W. (2014). Q*Power: A web-based program for designing diagnostic assessments (Version 1.0) [Computer software]. Athens, GA. Available from http://www.lainebradshaw.com/qpower.

Bradshaw, L. (2008) Website: http://www.mathtasks.com.

Currently Funded External Projects

Principal Investigator: *Diagnostic Inventories of Cognition in Education* (2017-2021). Institute of Educational Sciences, Cognition and Student Learning: Goal 5 Measurement. $1,400,000.

Previously Funded Grant Proposals

Co-Principal Investigator: *Assessing the Structure of Knowledge in Teaching Mathematics* (2016-2020). National Science Foundation: Discovery Research K-12 ~$1,700,000. PI: Erik Jacobson.

Co-Principal Investigator: *Developing Enhanced Assessment Tools for Capturing Students' Procedural Skills and Conceptual Understandings in Math* (2015-2019). United States Department of Education, Institute of Educational Sciences: Cognition in Special Education, Measurement Goal 5 ~$1,600,000. PI: Brian Bottge.

Co-Principal Investigator: *Investigating Proportional Reasoning from Two Perspectives* (2014-2018). National Science Foundation: Education and Human Resources Core: Research on Educational and Learning (REAL) Program ~$1,333,000. PI: Andrew Izsák.

Principal Investigator: *Engineering Diagnostic Concept Inventories* (Summer, 2015): University of Georgia College of Education Early Career Faculty Grant, $6,000.

Principal Investigator: *UGA Mathematics Curriculum Team* (2015-2016). Office of STEM Education, University of Georgia ~$1000.

Principal Investigator: *Developing Validity Arguments for Model-based Diagnostic Feedback* (Summer, 2014): University of Georgia College of Education $10,000.

Principal Investigator: *UGA Mathematics Curriculum Team* (2014-2015). Office of STEM Education, University of Georgia ~$1000.

Key Personnel: *Collaborative Research: Assessing Teachers' Pedagogical Design Capacity and Mathematics Curriculum*. Supplement to National Science Foundation: Discovery Research K-12 (DRL-0918141), $59,000. PI: Janine Remillard and Ok-Kyeong Kim.

Key Personnel: *AutoMentor: Virtual Mentoring and Assessment in Computer Games for STEM Learning* (2009-2014). National Science Foundation: Division of Research on Learning in Formal and Informal Settings (DRL-0918409) $2,080,693. PI: David Williamson Shaffer.

Key Personnel: *Diagnosing Teachers' Multiplicative Reasoning* (2008-2010). National Science Foundation: Discovery Research K-12 (DRK-12; DRL-0822064), $944,163. PI: Andrew Izsák.

Key Personnel: Spencer Foundation, *Proportional Reasoning of Middle Grades Pre-Service Teachers* (2013-2014), $39,992. PI: Andrew Izsák.

Technical Reports

Bradshaw, L. (2015a). *An Evaluation of Diagnostic Classification Model-based Computer Adaptive Testing Algorithm for PARCC Diagnostic Assessments in Mathematics Comprehension and Decoding*. Technical Report. Pearson Education.

Bradshaw, L. (2015b). *FlexMIRT Estimation Accuracy under Expected Field Test Designs for Diagnostic Classification Model-based PARCC Diagnostic Assessments*. Technical Report. Pearson Education.

Bradshaw, L. (2014a). *PARCC Diagnostic Assessments: Design Research for Diagnostic Classification Model-based PARCC Diagnostic Assessments in Mathematics Comprehension and Decoding*. Technical Report. Pearson Education.

Bradshaw, L. (2014b). *Diagnosing attributes using the Curriculum Embedded Mathematics Assessment*. Technical Report. University of Pennsylvania.

Presentations (Abbreviated to include 2016-Current)

*Indicates collaboration with a student during their graduate studies.
°Indicates invited presentation.
2019

Bradshaw, L., Arena, E., & Weber, D. (2019). *Innovative assessment pilot in the state of Georgia: Using Navvy for actionable feedback and accountability.* Paper presented at the Student Assessment Conference of the Council of Chief State School Officers in Orlando, Florida.

Bradshaw, L., & Maddox, K. (2019). *Eliciting higher-order thinking using multiple-choice questions: An application in through-year middle grade mathematics assessments.* Paper presented at the Classroom Assessment conference of the National Council of Measurement in Education in Boulder, Colorado.

*Schellman, M., & **Bradshaw, L.** (2019). *Measuring within-item multidimensionality on a middle grade statistics concept inventory.* Paper presented at the Classroom Assessment conference of the National Council of Measurement in Education in Boulder, Colorado.

*Bao, Y., & **Bradshaw, L.** (2019). *Investigation of model invariance for a dcm with polytomous attribute.* Paper presented at the annual meeting of the National Council of Measurement in Education in Toronto, Ontario, Canada.

*Feldberg, Z. & **Bradshaw, L.** (2019). *Reporting results from diagnostic classification models for teachers.* Paper presented at the annual meeting of the National Council of Measurement in Education in Toronto, Ontario, Canada.

*Feldberg, Z. & **Bradshaw, L.** (2019). *Use of technology-based, diagnostic assessment tools in the classroom.* Paper presented at the annual meeting of the Northeastern Educational Research Association in Trumbull, CT.

*Xue, K., & **Bradshaw, L.** (2019). *Non-parametric attribute profile estimation and q-matrix reconstruction using modified autoencoder.* Paper presented at the annual meeting of the National Council of Measurement in Education in Toronto, Ontario, Canada.

2018

Bradshaw, L. (April, 2018). *Using classification-based psychometrics in local assessment systems for feedback and accountability.* Member of panel presentation at the annual meeting of the National Council of Measurement in Education in New York, NY.

Bradshaw, L., Famularo, L., Lee, H., & Masters, J. (April, 2018). *Designing diagnostic inventories of cognition in education.* Paper presented at the annual meeting of the American Educational Research Association in New York, NY.

*Bao, Y., & **Bradshaw, L.** (April, 2018). *A diagnostic classification model for polytomous attributes.* Paper presented at the annual meeting of the National Council of Measurement in Education in New York, NY.

*Feldberg, Z., & **Bradshaw, L.** (April, 2018). *Reporting results from diagnostic classification models for teachers.* Poster presented at the annual meeting of the American Educational Research Association in New York, NY.

*Shen, Y., Bao, Y., Wang, S., & **Bradshaw, L.** (April, 2018). *Detecting Misconceptions and Estimating Ability Simultaneously: A Hybrid Computerized Adaptive Testing Framework.* Paper presented at the annual meeting of the National Council of Measurement in Education in New York, NY.

*Zor, S., & **Bradshaw, L.** (April, 2018). *Designing field tests for multidimensional classification models.* Poster presented at the annual meeting of the National Council of Measurement in Education in New York, NY.

2017
*Feldberg, Z., & **Bradshaw, L.** (October, 2017). Technology-based diagnostic assessment systems: Interpretations and Use. Paper presented at the annual meeting of the Northeastern Educational Research Association in Trumbull, Connecticut, U.S.

*Bao, Y., & **Bradshaw, L.** (October, 2017). A diagnostic classification model for polytomous attributes. Paper presented at the annual meeting of the Northeastern Educational Research Association in Trumbull, Connecticut, U.S.

*Feldberg, Z., & **Bradshaw, L.** (August, 2017). Use of technology-based, diagnostic assessment tools in the classroom. Paper presented at the annual meeting of the Northeastern Educational Research Association in Trumbull, Connecticut, U.S.

*Shen, Y., Bao, Y., Wang, S., & **Bradshaw, L.** (July, 2017). Using computerized adaptive testing to detect students' misconceptions: Exploration of item selection. Paper presented at the annual meeting of the *International Association for Computerized Adaptive Testing* in Japan.

*Bao, Y., & **Bradshaw, L.** (April, 2017). *Item selection methods for computer adaptive testing with hierarchical diagnostic classification models.* Paper presented at the annual meeting of the National Council of Measurement in Education in San Antonio, TX.

*Bradshaw, L., Guthrie, K., & Bian, M. (April, 2017). Digital and remote collection of response process validity evidence. Paper presented at the annual meeting of the American Educational Research Association in San Antonio, TX.

*Madison, M., & **Bradshaw, L.** (April, 2017). *Assessing intervention effects in a diagnostic classification model framework.* Paper presented at the annual meeting of the National Council of Measurement in Education in San Antonio, TX.

Harrison, A., Kaff, M., **Bradshaw, L.**, Naqvi, N., Campbell, J., Manji, K., . . . Paff, M. (2017). Examining Measurement Approaches to Assessing ASD Knowledge in

Cross-Cultural Contexts. In *African Regional International Meeting for Autism Research (IMFAR)*. Stellenbosch, South Africa
Regional

Harrison, A., **Bradshaw, L.**, Naqvi, N., Paff, M., & Campbell, J. (2017). *A Proposed Solution to Psychometric Concerns with Existing ASD Knowledge Tools*. Poster session presented at the meeting of International Meeting for Autism Research

2016
Izsak, A., Beckman-Kazez, S., **& Bradshaw, L.** (November, 2016). *Diagnosing reasoning to measure growth in pre-service middle-grades teachers' facility with fraction arithmetic.* Paper presented at the annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education in Tuscon, AZ.

*Madison, M. & **Bradshaw, L.** (October, 2016). *An application of a longitudinal diagnostic classification model.* Paper presented at the annual meeting of the Northeastern Educational Research Association in Trumbull, Connecticut, U.S.

*Bao, Y., & **Bradshaw, L.** (July, 2016). *Attribute-level Item Selection Method for DCM-CAT.* Paper presented at the 2016 International Meeting of the Psychometric Society in Asheville, North Carolina, U.S.

*Madison, M. & **Bradshaw, L.** (July, 2016). *Assessing change over time in a general diagnostic classification model.* Paper presented at the 2016 International Meeting of the Psychometric Society in Asheville, North Carolina, U.S.

°**Bradshaw, L.** (April, 2016). *Designing a large-scale, classification-based assessment system for diagnosing standards mastery.* Paper presented at annual meeting of the National Council on Measurement in Education in Washington, DC.

Bradshaw, L. & Levy, R. (April, 2016). *Interpreting examinee results from classification-based models.* Paper presented at the annual National Council on Measurement in Education conference in Washington, DC.

*Bao, Y., & **Bradshaw, L.** (2016). *The Impact of Model Misspecification in a DCM-CAT.* Paper presented at the annual meeting of the National Council on Measurement in Education in Washington, DC.

*Madison, M., & **Bradshaw, L.** (2016). *The.* Paper presented at the annual meeting of the National Council on Measurement in Education in Washington, DC.

Dhaliwal, T , Hembry, T., & **Bradshaw, L.** (2016). *Achieving the Promise of CDMs: Communicating CDM-based Assessment Results.* Paper presented at the annual National Council on Measurement in Education conference in Washington, DC.

2015
*Kang, E. K., Spangler, D. A., & Bradshaw, L. (October, 2015). Relationship between prospective primary teachers' mathematics knowledge for teaching and beliefs. In

Proceedings of the 2015 international conference on mathematics education: Vol. 2. The International Perspective on Curriculum and Evaluation of Mathematics Vol. 2 (pp. 164-170). Seoul, Republic of Korea.

*Bao, Y. & **Bradshaw, L.** (July, 2015). Power analysis of item-level interactions in a general diagnostic classification model framework. Paper presented at the International Meeting of the Psychometric Society in Beijing, China.

Bradshaw, L. (June, 2015). *PARCC diagnostic assessments for mathematics comprehension: A diagnostic classification model approach*. Paper presented at the Council of Chief State School Officers (CCSSO) 2015 National Conference on Student Assessment (NCSA) in San Diego, California.

Hembry, T., Dhaliwal, T., Koepfler, J., & **Bradshaw, L.** (2015). *Improving the effectiveness of reporting for assessments using cognitive diagnostic models based on empirical data.* Paper presented at the Council of Chief State School Officers (CCSSO) 2015 National Conference on Student Assessment (NCSA) in San Diego, California.

Bradshaw, L. (April, 2015). Reliability for a node-based dynamic assessment. In A. Clark (Chair) *Psychometrics in a Learning Maps Environment*. Symposium presented at the annual National Council on Measurement in Education conference in Chicago, IL.

*Madison, M., **& Bradshaw, L.**, & Hollingsworth, W. (April, 2015). *Using Q*Power to refine diagnostic assessment designs.* Paper presented at the annual American Educational Research Association conference in Chicago, IL.

*Sen, S., & **Bradshaw, L.** (April, 2015). *Performance of relative fit indices: A comparison across model types.* Paper presented at the annual National Council on Measurement in Education conference in Chicago, IL.

Honors and Awards

40 under 40, 2020
      Awarded by the University of Georgia Alumni Association

Arthur M. Horne Faculty Award for Engagement and Outreach, 2020
      Awarded by the University of Georgia College of Education: Practice/Outreach

Carl Glickman Faculty Fellow Award, 2018
      Awarded by the University of Georgia College of Education: Research/Outreach

Jason Millman Promising Measurement Scholar Award, 2015
      Awarded by the National Council of Measurement in Education

Ocie T. Dekle Excellence in Teaching Award, 2015
      Awarded by The University of Georgia College of Education

Sarah H. Moss Fellowship, 2013-2014
Awarded by The University of Georgia Center for Teaching and Learning for an amount of $10,000. Assignment to the University of Nottingham, Nottingham, England

Outstanding Dissertation Award, 2013
Awarded by the American Educational Research Association (AERA) Cognition and Assessment Special Interest Group

Joseph R. Hooten Award for Excellence in Mathematics Education, 2007
Awarded by Mathematics Education Department at the University of Georgia

Selected National Leadership Positions and Service Activities

Organization Leadership
National Council on Measurement in Education
(i) Bradley Hanson Award Committee (2014 –2016, 2018-2019, 2019-2020, 2020-2021)
(ii) Faculty Advisor, Graduate Student Issues Committee (2013 – 2015)
(iii) Newsletter Advisory Board Member (2012 – 2016)
American Educational Research Association
(i) Chair, Cognition and Assessment Special Interest Group (SIG) (2015 – 2018)
(ii) Vice-chair, Cognition and Assessment SIG (2012 – 2015)
(iii) Conference Program Co-Chair, Division D: Quantitative Methods and Statistical Theory (2013, 2014)

Editorial Leadership
Grant Review Panelist
Institute of Education Sciences, Science, Technology, Engineering, and Mathematics (STEM)
Editorial Board Member
Educational Assessment
Peer Reviewer for Journals
Applied Psychological Measurement; Educational Measurement: Issues and Practice; International Journal of Testing; Journal of Classification; Journal of Research in Mathematics Education; Multivariate Behavioral Research; Psychometrika

Technical Advisory Committee Member
Nevada State Department of Education (2020-present)
Mississippi Department of Education (2019-present)
Utah State Board of Education (2018-present)
Educational Records Bureau (2014 – Present)
Curriculum Associates (2015 – 2016)

Consulting
Chief Psychometric Consultant, PARCC Diagnostic Assessment Project (2013-2016)