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**Robert A. Henson**

School of Education  
Associate Professor - Educational Studies  
The University of North Carolina at Greensboro  
Date of Hire: 2012  
rahenson@uncg.edu

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**Professional Interests**

*Research:* Constrained Latent Class Models, Finite Mixture Models and Random Effects Models

*Teaching:* Introductory Statistics, Advanced Statistics, Multivariate Statistics, Psychometrics

**Academic Background**

Ph.D. University of Illinois, Urbana, IL, Psychology (Quantitative), 2004

*Dissertation Title:* "Test Discrimination and Test Construction for Cognitive Diagnosis"

A.M. University of Illinois, Urbana, IL, Psychology, 2003

*Thesis Title:* "Comparing Pathological to Non-Pathological Gamblers Based on Preferences"

M.S. University of Illinois, Urbana, IL, Statistics, 2002

B.S. University of Illinois, Urbana, IL, Psychology, 1998

**Employment**

2012-Present: Associate Professor, The University of North Carolina at Greensboro, School of Education

2011-2012: Assistant Professor, University of Michigan, School of Education

2005-2011: Assistant Professor, The University of North Carolina at Greensboro, School of Education

**Personal and Computer Skills**

PSYCHOMETRICS & STATISTICS (Factor analysis, Structural equation models, Classical test theory, Item Response Theory, and Generalizability; Multivariate Analysis, Linear and nonlinear regression, hierarchical linear modeling, classification and clustering, biological statistics, and categorical variable analysis)

STATISTICAL SOFTWARE PROFICIENCY (Experience using a variety of statistical software, e.g. SPSS, SYSTAT, SAS, S-Plus, R, BILOG, SUDAAN, & MATLAB) OFFICE

STATISTICAL COMPUTING & PROGRAMMING (Programming skills using FORTRAN)

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**RESEARCH**


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**PAPERS****Refereed Papers:**

- DiBello, L., Henson, R., & Stout, W., (2015). A Family of Generalized Diagnostic Classification Models for Multiple Choice Option-Based Scoring. *Applied Psychological Measurement*, 39(1), 62-79.
- Weymouth, B., Buehler, C., Zhou, N., Henson, R.(2015) A Meta-Analysis of Parent-Adolescent Conflict: Disagreement, Hostility, and Youth Maladjustment. *Journal of Family Theory & Review*.
- Wester, K., Ivers, N., Villalba, J., Trepal, H., & Henson, R., (Accepted). The Relationship Between Non-Suicidal Self-Injury and Suicidal Ideation, *Journal of Counseling & Development*.
- Ackerman, T.A. & Henson, R. A. (2014 ) Graphical representations of items and tests that are measuring multiple abilities. *Proceedings of the Psychometric Society*. (In press)
- Schmitz, R., Cone, J., Tritsch, A., Pye, M., Montgomery, M., Henson, R., & Shultz, S. (2014). Changes in drop-jump landing biomechanics during prolonged intermittent exercise. *Sports Health A Multidisciplinary Approach*; 6(2):128-35. DOI:10.1177/1941738113503286
- Shu, Z. Henson, R., & Willse, J. T.(2013). Using neural network analysis to define an efficient method of DINA model estimation for small sample sizes. *Journal of Classification*
- Schmitz, R., Cone, J., Copple, T., Henson, R., & Shultz, S. (2013). Lower Extremity Biomechanics and Maintenance of Vertical Jump Height during Prolonged Intermittent Exercise. *Journal of Sport Rehabilitation*, 23(4)
- Shu, Z., Henson, R. & Leucht, R. (2013). Using deterministic, gated item response theory model to detect test cheating due to item compromise. *Psychometrika*, <http://dx.doi.org/10.1007/s11336-012-9311-3>
- Steinley, D., Brusco, M. J., & Henson, R. A. (2012). Principal cluster axes: A projection pursuit index for the preservation of cluster structures in the presence of data reduction. *Multivariate Behavioral Research*, 47, 463-492.
- Montgomery MM, Shultz SJ, Schmitz RJ, Wideman L, Henson RA. (2012) Influence of lean body mass and strength on landing energetics. *Medicine and Science in Sports and Exercise*. 44(12):2376-83.
- Cone, J. Berry, N., Goldfarb, A., Henson, R., Schmitz, R., & Wideman, L. (2012). Effects of an individualized soccer match simulation on vertical stiffness and impedance, *Journal of Strength and Conditioning Research*, 26(8), 2027-36.
- Liu, Y., Douglas, J., & Henson, R. (2009). Testing person fit in cognitive diagnosis, *Applied Psychological Measurement*.
- Henson, R. (2009) Diagnostics classification models: Thoughts and future directions, *Measurement: Interdisciplinary Research & Perspective*, 7(1), 34-36.
- Cook, E., Beuhler, C. & Henson, R. (2009) Parents and peers as social influences to deter antisocial behavior. *Journal of Youth and Adolescence*.

- Henson, R., Templin, J., & Willse, J. (2009). Defining a family of cognitive diagnosis models using log-linear models with latent variables," *Psychometrika*, 74(2), 191-210.
- Silvia, P. J., Henson, R. A., & Templin, J. L. (2009). Are the sources of interest the same for everyone? Using multilevel mixture models to explore individual differences in appraisal structures. *Cognition and Emotion*, 23, 1389-1406.
- Henson, R., Roussos, L., Douglas, J., & He, X. (2008). Cognitive diagnostic attribute level discrimination indices. *Applied Psychological Measurement*, 32 (4), 275-288.
- Templin, J., Henson, R., & Templin, S. (2008). Robustness of hierarchical modeling of attribute correlation in cognitive diagnosis models. *Applied Psychological Measurement*.
- Henson, R., Templin, J., & Douglas, J. (2007). Using cognitive diagnosis models for development of efficient sum-scores. *Journal of Educational Measurement*, 44(4), 361-376.
- Roussos, L., Templin, J., & Henson, R. (2007). Skills diagnosis using IRT-based latent class models. *Journal of Educational Measurement*, 44(4), 293-311.
- Templin, J., & Henson, R. (2006). Measurement of psychological disorders using cognitive diagnosis models. *Psychological Methods*, 11 (3), 287-305.
- Henson, R., & Douglas, J. (2005). Test construction for cognitive diagnosis. *Applied Psychological Measurement*, 29 (4), 262-277.
- Steinley, D., & Henson, R. (2005). OCLUS: An analytic method for generating clusters with known overlap. *Journal of Classification*, 22, 221-250.

### **Books and Book Chapters:**

- Ackerman, T. A. & Henson, R. A. (Accepted) Obtaining understanding of two-dimensional MIRT models through graphical representations. In C. Wells and Faulkner-Bond (Eds.), *Educational measurement: From foundations to future*. New York: Guilford Publications, Inc. (In preparation)
- Rupp, A., Templin, J., & Henson, R. (2010). *Diagnostic Assessment: Methods, theory, and applications*. New York, NY: Guilford Press.
- Roussos, L., DiBello, L., Henson, R., Jang, E., & Templin, J. (2010). Skills diagnosis for education and psychology with IRT-based parametric latent class models. (in press), In S.E. Embretson and J. Roberts (Ed.) *New Directions in Psychological Measurement with Model-Based Approaches*. Washington, DC: American Psychological Association.
- Roussos, L., DiBello, L., Stout, B., Hartz, S., & Henson, R., J. Templin, (2007). The Fusion Model Skills Diagnosis System, In M. Gierl and J. Leighton (Ed.) *Cognitive Diagnostic Assessment in Education*. New York, NY: Cambridge University Press.

### **Papers Under Review:**

- Chiu, C., Zheng, Y., & Henson, R. (Under Review). Joint Maximum Likelihood Estimation for Cognitive Diagnosis Models.

Henson, R., Stevens, S., Lui, F., & Shin, N. (Under Review) A Generalized Nonparametric Approach to Diagnostic Classification for Polytomous Attributes.

Naumenko, O., & Henson, R. (Under Review) Multilevel Mediation: Methods for the 2-1-1 Case

### **Working Papers**

Henson, R. (2015). A diagnostic scree plot: Defining a method to determine dimensionality of diagnostic classification models.

Henson, R., DiBello, L., & Stout, W. (2015). A Generalized Approach to Defining Item Discrimination for DCMs

### **Research Reports**

Henson, R., Stout, W., & Templin, J. (2005). Using cognitive model-based sum-scores to do skills diagnosis, *ETS External Team Technical Report*.

Henson, R., & Templin, J. (2005). Hierarchical log-linear modeling of the attribute joint distribution, *ETS External Team Technical Report*.

Henson, R., & Templin, J. (2005). Fusion Model 'fit' indices, *ETS External Team Technical Report*.

Henson, R., & Templin, J. (2005). Q-matrix robustness for Arpeggio system analysis of the fusion model, *ETS External Team Technical Report*.

Roussos, L., Templin, J., & Henson, R. (2005) Theoretically grounded linking and equating for mastery/non-mastery skills diagnosis models, *ETS External Team Technical Report*.

Templin, J. & Henson, R. (2005) The enhanced simarpeggulator for heterogeneous attributes, *ETS External Team Technical Report*.

Templin, J. & Henson, R. (2005). Hierarchical models for skills diagnosis: Item response theory comparisons and complements, *ETS External Team Technical Report*.

Templin, J. & Henson, R. (2005). The random effects reparameterized unified model: A model for joint estimation of discrete skills and continuous ability, *ETS External Team Technical Report*.

Templin, J., Roussos, L., Templin, S., & Henson, R. (2005). Comparison of latent attributes joint distribution estimation methods, *ETS External Team Technical Report*.

Henson, R., & Templin, J. (2004). Creating a proficiency scale with models for cognitive diagnosis, *ETS External Team Technical Report*.

Henson, R., Roussos, L., & Templin, J. (2004). Cognitive diagnostic 'Fit' indices, *ETS External Team Technical Report*.

Templin, J., Henson, R., & Templin, S. (2004). Robustness of hierarchical modeling of attribute correlation in cognitive diagnosis models, *ETS External Team Technical Report*.

Henson, R., Stout W., Roussos, L., Douglas, J., & He, X. (2003). Estimation of attribute association, *ETS External Team Technical Report*.

Henson, R., & Douglas, J. (2003). Using cognitive diagnostic models for development of efficient sumscores, *ETS External Team Technical Report*.

Henson, R. A., Douglas J., Stout, W., Roussos, L., & He, X. (2003) Cognitive diagnostic reliability, *ETS External Team Technical Report*.

### **PATENTS**

2006 - "Test discrimination and test construction for cognitive diagnosis" Application Number 20060035207, *Pending*.

### **RESEARCH GRANTS**

#### **Funded-External:**

2014 – “Development of Accessible IRT-Based Models and Methodologies for Improving the Breadth and Accuracy of Item Option-Scored Diagnostic Assessments” (IES), Co-PI, (\$264,751)

2013 – “Developing an Empirically tested Learning Progression for the Transformation of Matter to Inform Curriculum, Instruction and Assessment Design,” Key Personnel, University of Michigan, NFS (\$87,303)

2012 – “Developing an Empirically tested Learning Progression for the Transformation of Matter to Inform Curriculum, Instruction and Assessment Design,” Key Personnel, University of Michigan, NFS (\$57,647)

2012 – “Faster Mixing Markov Chain Monte Carlo for Multidimensional IRT and Cognitive Diagnosis Models,” NSF-MMS (\$206,559.00), Co-PI

2010 – “Collaborative Research: Longitudinal Diagnostic Modeling,” NSF, (\$141,282) Recommended for reduced funding (\$33,448). Co-PI

2007 - "Constrained Finite Mixture Models for Psychological Diagnosis and Educational Assessment," NSF Grant #0648861, (\$120,225). Co-PI

2006 - "ABCTE Item Bank Calibration," Board for Certification of Teacher Excellence, (\$9,488). Co-PI

#### **Funded-Internal:**

2009 – “Assessing the Appropriateness of Diagnostic Modeling in a Unidimensional IRT Framework,” UNCG Regular Faculty Research Grant, (\$5000), PI

#### **Not Funded-External:**

2009 – “Collaborative Research: Longitudinal Diagnostic Modeling,” NSF, (141,282).

2006 - "Collaborative Research: Constrained Finite Mixture Models for Psychological Diagnosis and Educational Assessment," NSF, (\$132,324).



## PRESENTATIONS

### National/International:

- DiBello, L., Stout, W., & Henson, R., (2015). Henson Performance Benchmarks for GDCM-MC Option-Based Modeling, NCME Annual Meeting, Chicago, IL.
- Henson, R., DiBello, L., & Stout, W. (2015). A Generalized Approach to Defining Item Discrimination for DCMs, NCME Annual Meeting, Chicago, IL.
- Shear, B., Roussos, L., DiBello, L., Stout, W., & Henson, R., (2015). Fitting Diagnostic Classification Models to Distractor-Driven Tests for Validation Purposes. NCME Annual Meeting, Chicago, IL.
- Rupp, Templin, & Henson (2013) "Diagnostic Classification Models". A presentation given at the AERA Luncheon D, Annual Meeting.
- Henson, R. (2011, Sept). Challenges and Strengths of complex modeling for the use of measuring mathematical knowledge
- Henson, R. (2010, July). Diagnostic Classification Models: From Start to Finish. Psychometric Society Annual Meeting, Athens, Georgia.
- Henson, R. (2010, May). Q-matrix construction and refinement. National Council on Measurement in Education Conference, Denver, Colorado.
- Henson, R. (2010, May). The LCDM: Defining a family of diagnostic models. National Council on Measurement in Education Conference, Denver, Colorado.
- Shu, Z., Henson R. & Willse, J (2010, May). Using Neural Network Analysis to Define an Efficient Method of DINA Estimation for small Sample Sizes. American Educational Research Association, Denver, Colorado.
- Henson, R. (2009, April). Q-matrix construction and refinement. National Council on Measurement in Education Conference, San Diego, California.
- Henson, R. (2009, April). The LCDM: Defining a family of diagnostic models. National Council on Measurement in Education Conference, San Diego, California.
- Henson, R. & Templin, J. (2009, April). Using diagnostic model criteria as proficiency standards: combining psychometrics and statistics to produce accurate examinee classification. National Council on Measurement in Education Conference, San Diego, California.
- Choi, H., Templin, J., Henson, R. & Cohen, A. (2009, April). A diagnostic classification mixture Rasch model (DCMixRM) for mediating attributes and ability. National Council on Measurement in Education Conference, San Diego, California.
- Henson, R. & Templin, J., & Irwin, P. (2009, April). Ancillary random effects: A way to obtain diagnostic information from existing large scale tests. National Council on Measurement in Education Conference, San Diego, California.
- Templin, J & Henson, R. (2009, April). Practical issues in using diagnostic estimates: Measuring the reliability and validity of diagnostic estimates. National Council on Measurement in Education Conference, San Diego, California.

- Henson, R., & Templin, J. (2008, March). Implementation of standards setting for a geometry end-of-course exam using cognitive diagnosis. American Educational Research Association Conference. New York, New York.
- Templin, J., & Henson, R. (2008, March). Understanding the impact of skill acquisition: Relating diagnostic assessments to measurable outcomes. American Educational Research Association Conference. New York, New York.
- Henson, R., Templin, J., Burke, M., & Willse, J. (2008, March). Estimation of the log-linear model with latent classes for the purpose of cognitive diagnosis. National Council on Measurement in Education Conference, New York, New York.
- Henson, R. (2008, March). Q-matrix construction and refinement. National Council on Measurement in Education Conference, New York, New York.
- Templin, J., Cohen, A., & Henson, R. (2008, March). Constructing tests for optimal classification in standard setting. National Council on Measurement in Education Conference, New York, New York.
- Burke, M., Henson, J., & Templin, J. (2008, March). Assessing English proficiency with the logistic cognitive diagnosis model. National Council on Measurement in Education Conference, New York, New York.
- Templin, J., Henson, R., Rupp, A., & Jang, E. (2008, March). Cognitive diagnosis models for nominal response data. National Council on Measurement in Education Conference, New York, New York.
- Willse, J., Henson, R., & Templin, J. (2008, March). K-Means with latent class refinement: cognitive diagnosis with few assumptions. National Council on Measurement in Education Conference, New York, New York.
- Henson, R., Templin, J., & Willse, J. (2007, October). Using log-linear models with latent variables for model comparisons in skills assessment. International Conference on Advances in Interdisciplinary Statistics and Combinatorics, Greensboro, NC
- Henson, R. (2007, April). Test construction. Presented at National Council on Measurement in Education Conference, Chicago, Illinois.
- Henson, R. & Templin, J. (2007, April). Q-matrix construction. National Council on Measurement in Education Conference, Chicago, Illinois.
- Henson, R., & Templin, J. (2007, April). Large-scale language assessment using cognitive diagnosis models. National Council on Measurement in Education Conference, Chicago, Illinois.
- Henson, R., Templin, J., & Willse, J. (2007, April). Defining a family of cognitive diagnosis models using log-linear models with latent variables. National Council on Measurement in Education Conference, Chicago, Illinois.
- Staggs, V., Ledford, E., Templin, J., & Henson, R. (2007, April). Evaluating diagnostic model Q-matrix completeness using conditional covariance. National Council on Measurement in Education Conference, Chicago, Illinois.



- Templin, J. & Henson, R. (2007, April). Contrasting parameterizations of the proficiency space in models for skills assessment. National Council on Measurement in Education Conference, Chicago, Illinois.
- Templin, J., Henson R., Poggio, A., Irwin, P., & Poggio, J. (2007, April). Searching for cognitive structure in Kansas. National Council on Measurement in Education Conference, Chicago, Illinois.
- Templin, J., Poggio, A., Irwin, P., & Henson, R. (2007, April). Latent class model based approaches to standard setting. National Council on Measurement in Education Conference, Chicago, Illinois.
- Willse, J., Henson, R., & Templin, J. (2007, April). Using sum scores or IRT in place of cognitive diagnosis models: Can existing or more familiar models do the job? National Council on Measurement in Education Conference, Chicago, Illinois.
- Henson, R., & Templin, J. (2006, June). The DINO: A disjunctive model for skills assessment. Psychometric Society Meeting, Montreal, Canada.
- Templin, J., & Henson, R. (2006, June). Cognitive diagnosis: Concepts and common models. Invited presentation at Psychometric Society Meeting, Montreal, Canada.
- Templin, J., & Henson, R. (2006, June). The random effects reparameterized unified model: A constrained finite mixture model for skills diagnosis and psychological assessment. Psychometric Society Meeting, Montreal, Canada.
- Ackerman, T. , Bartz D., Henson, R., Templin, J., & Zhang, W. (2006, April). Evaluating a third grade science benchmark test using a skills assessment model: Q-matrix evaluation. National Council on Measurement in Education Conference, San Francisco, California.
- Henson, R. (2006, April). Test construction. National Council on Measurement in Education Conference, San Francisco, California.
- Henson, R., & Templin, J. (2006, April). Q-Matrix construction. National Council on Measurement in Education Conference, San Francisco, California.
- Henson, R., & Templin, J. (2006, April). Bayesian Q-matrix inference using the reparameterized unified model. National Council on Measurement in Education Conference, San Francisco, California.
- Templin, J. & Henson, R. (2006, April). A Bayesian method for incorporating uncertainty into Q-matrix estimation in skills assessment. National Council on Measurement in Education Conference, San Francisco, California.
- Henson, R. & Templin, J. (2006, February). Extending cognitive diagnosis to evaluate the validity of DSM criteria for the diagnosis of pathological gambling. Georgia Tech Measurement Conference, Atlanta, Georgia.
- Templin, J. & Henson, R. (2006, February). Using cognitive diagnosis models for the measurement and evaluation of pathological gambling. Georgia Tech Measurement Conference, Atlanta, Georgia.

- Ackerman, T., Bartz, D., Henson, R., & Templin, J. (2005, July). Creating and evaluating a third grade science benchmark test using a cognitive diagnosis model. Annual meeting of the Psychometric Society, Tilburg, Netherlands.
- DiBello, L., Henson, R., Templin, J., & Almond, R. (2005, July). Definition and estimation of skills classification reliability. Annual meeting of the Psychometric Society, Tilburg, Netherlands.
- Templin, J. & Henson, R. (2005, April). Cognitive diagnosis: Concepts and common models. Annual meeting of the National Council on Measurement in Education, Montreal, Canada.
- Henson, R., & Templin, J. (2005, December). Extending cognitive diagnosis to evaluate the validity of DSM criteria for the diagnosis of pathological gambling. Gambling and Addiction Conference, Las Vegas, Nevada.
- Templin, J. & Henson, R. (2004, December). Using cognitive diagnosis models for the measurement and evaluation of pathological gambling. Gambling and Addiction Conference, Las Vegas, Nevada.
- Templin, J., & Henson, R. (2004, November). Incorporating subjective probability into the design and development of cognitively diagnostic tests. Society for Judgment and Decision Making annual meeting, Minneapolis, Minnesota.
- DiBello, L., Templin, J., & Henson, R. (2004, June). Large-scale student profile scoring: Applications to operational tests--next generation TOEFL. Psychometric Society Meeting, Pacific Grove, California.
- Henson, R. (2004, April). Cognitive diagnostic reliability indices. National Council on Measurement in Education Conference, San Diego, California.

**Local:**

- Henson, R. (2007, November). Markov chain Monte Carlo estimation for a family of cognitive diagnosis models. Department of Statistics Colloquium, University of South Carolina.
- Henson, R. (2007, February). Assessing psychological disorders using models for cognitive diagnosis. The University of North Carolina at Greensboro Human Development and Family Studies Research Forum.
- Henson, R. (2004, September). Test discrimination and test construction for cognitive diagnosis. University of Illinois Quantitative Psychology Seminar, Champaign, Illinois.
- Henson, R. (2004, April). Cognitive diagnostic discrimination indices. University of Illinois Educational Psychology Seminar, Champaign, Illinois.
- Henson, R., Feasel, K., & Jones, L. (2000, April). Analysis of the gambling research instrument. 4th Rocky Mountain Psychological Association Conference, Reno, Nevada.
- Henson, R., Feasel, K., & Jones, L. (2000, March). Analysis of the gambling research instrument. University of Illinois Quantitative Psychology Seminar, Champaign, Illinois.

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**TEACHING**

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## **While at the University of Michigan**

### **Classes Taught**

- Item Response Models
- Large Scale Assessment
- Structural Equation Models

## **While at The University of North Carolina at Greensboro**

### **Classes Taught**

- Hierarchical Linear Modeling
- Item Response Theory
- Intermediate Statistical Methods in Education
- Large Scale Assessment
- Methods of Educational Research
- Multivariate Statistics

### **Classes Created**

- Classification Modeling
- Diagnostic Classification Modeling
- Hierarchical Linear Modeling
- Structural Equation Models

### **Developed Online Courses**

- Methods of Educational Research
- Educational Measurement and Evaluation

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## **SERVICE**

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### **While at the University of Michigan**

- Quantitative Methods Task Force
- Student Internship
- Reviewer for peer-reviewed journals:
  - Applied Psychological Measurement
  - Elementary School Journal
  - Journal of Classification
  - Multivariate Behavioral Research
  - Psychometrika

### **While at the University of North Carolina at Greensboro**

#### **Service to the University**

- Faculty Committee on Intercollegiate Athletes (2006-2010)
- Interdisciplinary Student Advising
  - Two Doctoral Student from Human Development and Family Studies
  - Three Masters Students from Consumer, Apparel, and Retail
  - Two Doctoral Students and One Masters Student in Exercise Sports and Sciences

#### **Service to the School of Education**

- Social Committee (2006-2011)
- Research Assignment Review Committee (2005-2011)
- Interdepartmental Advising
  - 13 Doctoral Students from Counseling in Education
  - One student from Specialized Education Services
  - One student from Teacher Education and Higher Education

#### **Service to the Department**

- Director of Graduate Studies (2013)
- Faculty Advisor for
  - Co-advisor for three Education Research Methodology dissertation
  - Serving on five Education Research Methodology dissertation committees
- Informal (Ad Hoc) Committees
  - Maintain Departmental Webpage (2007)
  - Evaluation of program course requirements (on going)
  - Development of an on-line certificate program (on going)

### **Service to the Profession**

- Served as Co-Program Director for the National Conference on Measurement in Education 2010 Annual Meeting
- Serving as task force to review the NCME Annual Meeting (an ad hoc committee)
- Reviewer for peer-reviewed journals:
  - Applied Measurement in Education
  - Applied Psychological Measurement
  - Asia Pacific Education Review
  - British Journal of Mathematical and Statistical Psychology
  - Educational Measurement: Issues and Practice
  - Educational and Psychological Measurement
  - Educational Research and Evaluation
  - Elementary School Journal
  - International Journal of Testing
  - Journal of the American Statistical Association
  - Journal of Applied Behavioral Science
  - Multivariate Behavioral Research
  - Psychometrika
- Co-Authored International Presentations