

# SHENGHAI DAI

Educational Psychology | College of Education | Washington State University  
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## EDUCATION

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- Ph. D.** Inquiry Methodology, Indiana University Bloomington July 2017  
*Specialization:* Psychometrics & Quantitative Methodology  
*Dissertation:* Investigation of Missing Responses  
in Implementation of Cognitive Diagnostic Models  
*Chair:* Dr. Dubravka Svetina
- M. S.** Applied Statistics, Indiana University Bloomington Dec. 2016
- M. A.** Language Testing, Beijing Language and Culture University June 2011
- B. A.** Teaching Chinese as a Second Language, Beijing Language and Culture University June 2005

## RESEARCH INTERESTS

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**Psychometrics:** Cognitive diagnostic models, (multidimensional) item response theory, large-scale assessment, classical test theory, differential item functioning, and language testing.

**Quantitative Methods:** Latent variable modeling, missing data analysis, structural equation modeling, multilevel/hierarchical modeling, and multivariate data analysis.

## RESEARCH EXPERIENCE

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- Assistant Professor of Educational Psychology** August 2017- present  
College of Education, Washington State University, Pullman, WA
- Research Assistant/Associate** 2016 -17  
Center for Collaborative Systems Change,  
Indiana Institute on Disability and Community, Bloomington, IN
- Research Assistant** 2011-14  
Project “*What Mathematics Do Students Know? Implications from NAEP for Curriculum and Policy*”, Center for Evaluation and Education Policy, IU, Bloomington, IN
- Research Associate**  
IU Lilly Family School of Philanthropy Summer 2015
- Research Assistant**  
AM I STEM Project, IU, Bloomington, IN Summer 2014
- Psychometrician**  
Human Anatomy and Physiology Society (HAPS) 2013-14

## TEACHING & WORK EXPERIENCE

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<b>Assistant Professor of Educational Psychology</b>	2017-present
College of Education, Washington State University, Pullman WA	
ED RES 565 Quantitative Research	
ED PSYCH 511 Classical and Modern Test Theory	
ED PSYCH 521 Special Topic: Data Management & Visualization	
ED PSYCH 569 Seminar in Quantitative Techs in Education (Multivariate Data Analysis)	
ED PSYCH 577 Item Response Theory	
ED PSYCH 574 Seminar in Educational Psychology	
<b>Instructor of Statistics Labs (EDUC-Y500)</b>	2014-16
Department of Counseling and Educational Psychology, Indiana University	
Intermediate Statistics (Y500); Psychometric Theory (Y617);	
Experimental Design in Education Research (Y603);	
Multivariate Data Analysis (Y604)	
<b>Exam/Test Assistant</b>	2006-08
Chinese Proficiency Test (HSK) Center, BLCU, Beijing, China	
<b>Test Designer &amp; Rater</b>	2008-11
Chinese Proficiency Test (HSK) Center, BLCU, Beijing, China	
<b>Teaching Assistant</b>	
IIEPM, Tsinghua University, Beijing, China	2005-06
<b>Intern Instructor of Chinese</b>	
College of Advanced Chinese Training, BLCU, Beijing, China	2004

## PUBLICATIONS

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(†= Work with Students)

### Peer-Reviewed Journal Articles

Zhang, X., **Dai, S.**, & Ardasheva, Y. (2020). Contributions of (de)motivation, engagement, anxiety in English listening and speaking. *Learning and Individual Differences*, 79, 1-13. <https://doi.org/10.1016/j.lindif.2020.101856>

**Dai, S.**, Wang, X., & Svetina, D. (2019). The application of minimum discrepancy estimation in the implementation of diagnostic classification models. *Behaviormetrika*, 46, 453-481. <https://doi.org/10.1007/s41237-019-00094-4>

†Higheagle Strong, Z., McMain, E.M., Frey, K.S., Wong, R.M., **Dai, S.**, & Jin, G., (2019). Ethnically diverse adolescents recount third-party actions that amplify their anger and calm their emotions after perceived victimization. *Journal of Adolescent Research*, 35(4), 461-488. <https://doi.org/10.1177/0743558419864021>

Liu, Z., Roggio, R., Day, D., Zheng, C., **Dai, S.**, & Bian, Y. (2019). Leader development begins at home: Overparenting harms adolescent leader emergence. *Journal of Applied Psychology*, 104(10), 1226–1242. <https://doi.org/10.1037/apl0000402>

Wang, X., Svetina, D., & **Dai, S.** (2019). Exploration of factors affecting the necessity of reporting test subscores. *Journal of Experimental Education*. 87(2), 179-192. <https://doi.org/10.1080/00220973.2017.1409182>

**Dai, S.**, Svetina, D., & Chen, C. (2018). Investigation of missing responses in Q-matrix validation. *Applied Psychological Measurement*. 42(8), 660–676. <https://doi.org/10.1177/0146621618762742>

Svetina, D., Feng, Y., Paulsen, J., Valdivia, M., Valdivia, A., & **Dai, S.** (2018). Examining DIF in the context of CDMs when the Q-matrix is misspecified. *Frontiers in psychology*, 9, 696. <https://doi.org/10.3389/fpsyg.2018.00696>

**Dai, S.**, Svetina, D., & Wang, X. (2017). Reporting subscores using R: A software review. *Journal of Educational and Behavioral Statistics*. 42(5), 617-638. <https://doi.org/10.3102/1076998617716462>

Svetina, D., **Dai, S.**, & Wang, X. (2017). Use of cognitive diagnostic model to study differential item functioning in accommodations. *Behaviormetrika*, 44(2), 313-349. <https://doi.org/10.1007/s41237-017-0021-0>

Svetina, D., Valdivia, A., Underhill, S., **Dai, S.**, & Wang, X. (2017). Recovery of parameters in multidimensional item response theory models under complexity and nonnormality. *Applied Psychological Measurement*. 41(7), 530-544. <https://doi.org/10.1177/0146621617707507>

## **Book Chapters**

**Dai, S.**, & Higheagle Strong, Z. (Accepted). Educational applications using large-scale survey data sets: Opportunities and challenges. In U. Luhanga & G. Allen (Ed.), *Basic elements of survey research in education: Addressing the problems your advisor never told you about*.

Wang, X. & **Dai, S.** (Accepted). Extreme response style in survey research. In U. Luhanga & G. Allen (Ed.), *Basic elements of survey research in education: Addressing the problems your advisor never told you about*.

Brown, N., **Dai, S.**, & Svetina, D. (2016). Analyzing NAEP data at the item level. In P. Kloosterman, D. Mohr, & C. Walcott (Ed.), *What mathematics do students know and how is that knowledge changing? evidence from the National Assessment of Educational Progress*. North Carolina. Information Age Publishing.

Brown, N., Svetina, D., & **Dai, S.** (2016). Analyzing NAEP data at the construct level. In P. Kloosterman, D. Mohr, & C. Walcott (Ed.), *What mathematics do students know and how is that knowledge changing? evidence from the National Assessment of Educational Progress*. North

Carolina. Information Age Publishing.

Kloosterman, P., Walcott, C., Brown, N. J. S., Mohr, D., Perez, A., **Dai, S.**, Roach, M., Wilson, L. D., & Huang, H. (2015). Using NAEP to analyze 8th-grade students' ability to reason algebraically. In Middleton, J. A., Cai, J., Hwang, S., (Eds.), *Large-scale studies in mathematics education*. New York. Springer.

## **Software Packages**

**Dai, S.**, French, B.F., Finch, W. H. (2020). DIFplus: Multilevel Mantel-Haenszel Statistics for Differential Item Functioning Detection. (R package version 1.1) [Computer software].  
<https://cran.r-project.org/package=DIFplus>.

**Dai, S.**, Wang, X., & Svetina, D. (2019). subscore: Subscore computing functions in classical test theory. (R package version 3.1) [Computer software].  
<http://CRAN.R-project.org/package=subscore>.

**Dai, S.**, Wang, X., & Svetina, D. (2019). TestDataImputation: Missing item responses imputation for test and assessment data. (R package version 1.1) [Computer software].  
<http://CRAN.R-project.org/package=TestDataImputation>.

## **PRESENTATIONS**

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### **Conference Presentations**

Qian, M., **Dai, S.** & Wang, X. (2020, April) *Illustration of Multilevel Explanatory Item Response Theory Model Differential Item Functioning Testing With the Creative Thinking Scale* [Poster Session]. AERA Annual Meeting San Francisco, CA. <http://tinyurl.com/stc5x48> (Conference Canceled)

Zhang, X., **Dai, S.** & Ardasheva, Y. (2020, April) *Factors Predicting English Listening and Speaking Learning in China's Tertiary Education* [Roundtable Session]. AERA Annual Meeting San Francisco, CA. <http://tinyurl.com/vgbte98> (Conference Canceled)

**Dai, S.** (2019, April). *Identifying predictors of students' skipping behavior on NAEP mathematics assessments: A random forest approach*. Paper presented at the annual meeting of the American Educational Research Association, Toronto, Canada.

**Dai, S.**, & Wang, X. (2019, April). *Classification methods and criteria in application of cognitive diagnostic models*. Paper presented at the annual meeting of the American Educational Research Association, Toronto, Canada.

†McMain, E.M., Higheagle Strong, Z., Wong, R.M., Frey, K.S., Jin, G., & **Dai, S.** (2019, April). *Ethnically-diverse adolescents describe bystander actions that calm victims' emotions and amplify*

*victims' anger*. Paper presented at the annual meeting of the American Educational Research Association, Toronto, Canada.

**Dai, S., & Higheagle Strong, Z.** (2019, August). *Identifying protective factors for Native American student learning using NAEP data*. Paper presented at the annual meeting of the American Psychological Association, Chicago.

†Ceylan, M., & **Dai, S.** (2019, August). *Investigating item parameter drift across computer-based and paper-based assessments in PISA 2015*. Paper presented at the annual meeting of the American Psychological Association, Chicago.

Qian, M., **Dai, S., & Wang, X.** (2019 August). *DIF detection using multi-group CFA and explanatory IRT models*. Paper presented at the annual meeting of the American Psychological Association, Chicago.

Wang, X., & **Dai, S.** (2019, August). *Is extreme response style irrelevant to item content?* Paper presented at the annual meeting of the American Psychological Association, Chicago.

**Dai, S., & Svetina, D.** (2018, April). *Impact of Q-matrix and assessment designs on application of cognitive diagnostic models*. Paper presented at the annual meeting of the American Educational Research Association, New York, NY.

**Dai, S., Wang, X., & Svetina, D.** (2018, April). *A further investigation of the generalized dimensionality discrepancy measure for (multi)dimensionality assessment*. Paper presented at the annual meeting of the National Council on Measurement in Education, New York, NY.

Paulsen, J., **Dai, S., & Wang, X.** (2018, April). *Comparing reliability estimation methods in CDMs*. Paper presented at the annual meeting of the American Educational Research Association, New York, NY.

Wang, X., **Dai, S., Paulsen, J., & Zhang, O.** (2018, April). *The comparison of reliability estimates in multidimensional tests*. Paper presented at the annual meeting of the National Council on Measurement in Education, New York, NY.

Svetina, D., Valdivia, A., Feng, Y., Valdivia, M., Paulsen, J., & **Dai, S.** (2018, April). *Examining DIF in the context of CDMs when the Q-matrix is misspecified*. Paper presented at the annual meeting of the National Council on Measurement in Education, New York, NY.

**Dai, S., Wang, X., Svetina, D., Underhill, S., & Feng, Y.** (2017, April). *The application of minimum discrepancy estimation in implementation of cognitive diagnostic models*. Paper presented at the annual meeting of the American Educational Research Association, San Antonio, TX.

**Dai, S., & Svetina, D.** (2017, April). *Investigation and treatment of missing responses in implementation of cognitive diagnostic models*. Paper presented at the annual meeting of the

American Educational Research Association, San Antonio, TX.

**Dai, S.,** Svetina, D., & Chen, C. (2017, April). *Dealing with missingness in cognitive diagnostic models when the Q-matrix is misspecified*. Paper presented at the annual meeting of the National Council on Measurement in Education, San Antonio, TX.

**Dai, S.,** Svetina, D., & Wang, X. (2017, April). *Making multilevel diagnostic inferences in large-scale assessments*. Paper presented at the annual meeting of the National Council on Measurement in Education, San Antonio, TX.

Chen, C., **Dai, S.,** & Zhang, J. (2017, April). *Comparison of three Q-matrix validation methods for developing cognitive diagnostic assessments*. Paper presented at the annual meeting of the National Council on Measurement in Education, San Antonio, TX.

Wang, X., Svetina, D., **Dai, S.** & Zhang, O. (2017, April). *How much can we gain from collateral information for subscore reporting?* Paper presented at the annual meeting of the National Council on Measurement in Education, San Antonio, TX.

Chen, C, Zhang, J., & **Dai, S.** (2017, April). *The effects of Q-matrix misspecification on classification accuracy and consistency for cognitive diagnostic assessment*. Paper presented at the annual meeting of the American Educational Research Association, San Antonio, TX.

Svetina, D., Valdivia, R., Underhill, S., **Dai, S.,** & Wang, X. (2016, April). *Parameter recovery in multidimensional item response theory models under complexity and nonnormality*. Paper presented at the annual meeting of the National Council on Measurement in Education, Washington, D.C.

Wang, X., Svetina, D., & **Dai, S.** (2016, April). *Exploration of factors affecting the necessity of reporting test subscores*. Paper presented at the annual meeting of the National Council on Measurement in Education, Washington, D.C.

**Dai, S.,** Svetina, D., & Brown, N. J. S. (2015, April). *Predicting skipping behavior in NAEP mathematics assessment: A multilevel modeling approach*. Poster presented at the annual meeting of the National Council on Measurement in Education, Chicago, IL.

Maltese, A., Ross, H., & **Dai, S.** (2015, April). *Assessing multinational interest in STEM*. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Maltese, A., Ross, H., & **Dai, S.** (2014, March). *A comparison of STEM experience in Australia, China, and the United States*. Paper presented at the Midwest Conference of the Comparative and International Education Society (CIES), Bloomington, IN.

Brown, N., **Dai, S.** & Svetina, D., (2014, April). *Predictors of omitted responses on the 2009 National Assessment of Educational Progress (NAEP) mathematics assessment*. Poster presented at the annual meeting of the American Educational Research Association, Philadelphia, PA.

Brown, N., Svetina, D., & **Dai, S.** (2014, April). *Impact of methods of scoring omitted responses on achievement gaps*. Paper presented at the annual meeting of the National Council on Measurement in Education, Philadelphia, PA.

Chen, C., Zhang, J., & **Dai, S.** (2014, April). *A case study of optimizing Q-matrix in cognitive diagnostic assessment*. Paper presented at the annual meeting of the National Council on Measurement in Education, Philadelphia, PA.

**Dai, S.** (2013, April) *Do skill profiles and multidimensionality tell the same thing? Application of multidimensional item response theory models and cognitive diagnostic models to Chinese proficiency listening test*. Poster presented at the Cognition and Assessment SIG Poster Session, the annual meeting of the American Educational Research Association, San Francisco, CA.

### **Other Presentations**

Howland, A., Wu, P-J., & **Dai, S** (2016). *The Indiana Maternal, Infant, Early Childhood Home Visiting Program (IN-MIECHV) Quarterly Benchmark Reports for FY15*. Report discussions presented to the Indiana State Department of Health, Indiana Department of Child Services, Healthy Families Indiana, and Indiana Nurse-Family Partnership, Indianapolis, IN.

Howland, A. & **Dai, S** (2017). *The Indiana Maternal, Infant, Early Childhood Home Visiting Program (IN-MIECHV) Quarterly Benchmark Reports for FY15*. Report discussions presented to the Indiana State Department of Health, Indiana Department of Child Services, Healthy Families Indiana, and Indiana Nurse-Family Partnership, Indianapolis, IN.

### **FUNDING**

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#### **Awarded**

*Education Research in the Era of Big Data – Evidence from Large-Scale Surveys* (With K. Carbonneau).

Role: PI, WSU College of Education High-Risk/High-Reward grant, (2019-2020), \$10,000.

*Advancing Education Research Using Large-Scale Assessment Data*. Role: PI, WSU New Faculty Seed Grant Competition, (2019-2020), \$18,191.

*Psychometric Analysis for the IT-Related Self-Efficacy Measure* (With D. Compeau). Role: Psychometrics and Statistics Expert, Washington State University, (2019-2020), \$6,000.

#### **Under Review**

*Teaching how they are taught: Increasing teachers' self-efficacy and ability to engage learners across contexts and situations* (With J. Egbert & Y. Ardsheva). Role: Co-PI, Spencer Research Grants on Education: COVID-19 Related Special Grant Cycle, (2020-2021), \$50,000.

*Using machine learning and multilevel modeling to identify predictors of at-risk students' achievement and self-concept on 2018 PISA Reading Assessment* (With Y. Ardsheva & R.W. Danielson). Role: PI, AERA Research Grant Program, (2020-2022), \$35,000.

#### **Not Awarded**

*Mathematics Instruction and Assessment as Moderators of Student Risk Factors* (With A. Howland & C. Walcott). Role: Co-PI, Institute of Education Sciences, (2020-2022), \$564,000.

*Strengthening the Research Capacity of Social Science Faculty at Ala-Too International University* (With M. Trevisan). Role: PI, American Councils in International Education - Central Asia University Partnerships Program, (2020-2021), \$22,500.

*Equipping the Toolbelt of Biostatistics in the Era of Big Data* (With R. Danielson). Role: Co-PI, National Institute of Health Summer Institute in Biostatistics, (2018), \$736,810.

*Development of a Measure of Test-Optional Applicants' Motivational-Developmental Attributes* (With B. French & A. Kaplan). Role: Co-PI, Institute of Education Sciences, (2018), \$ 1,400,000.

## PROFESSIONAL MEMBERSHIPS

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American Educational Research Association	2012 – present
Division D - Psychometrics, Measurement, and Assessment	
SIG – Cognition and Assessment	
SIG – Measurement and Assessment in Higher Education	
SIG – Large-Scale Assessment	
National Council on Measurement in Education	2012 – present
Psychometric Society	2012 – present
American Psychological Association	2018 – present
Division 5 - Quantitative and Qualitative Methods	
Division 15 - Educational Psychology	

## SERVICE

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### WSU University Service

WSU Center for Institutional Research Computing Advisory Committee	2017 – present
WSU New Faculty Orientation – Second Year Faculty Panel Speaker	2018
WSU RA and \$10K Competition – Reviewer/Judge Panel	2019

### WSU College of Education Service

CoE Scholarship Review	2018
CoE Graduate Studies Committee	2018 – present

### WSU Department Service

Ed-Psych Recruitment Committee	2017 – present
Ed-Psych Program Website Design/Maintenance	2017 – present

### Professional Service

<b>Statistical and Methodological Advisor</b> , <i>Journal of School Psychology</i>	2018 – present
<b>Consulting Editor</b> , <i>Journal of Experimental Education</i>	2019 - present
<b>Associate Editor</b> , <i>Frontiers in Education</i> , section <i>Assessment, Testing and Applied Measurement</i>	2020 – present
<b>Review Editor</b> , <i>Frontiers in Education</i>	2018 – 20



**Ad-Hoc Reviewer** - Journal Manuscripts 2015 – present  
*Journal of Educational Measurement, Frontiers in Education,*  
*Applied Psychological Measurement, Educational and Psychological Measurement,*  
*British Journal of Mathematics and Statistical Psychology,*  
*Educational Measurement: Issues and Practice, International Journal of Testing,*  
*Journal of Engineering Education, Frontiers in Psychology,*  
*Journal of Modern Applied Statistical Methods, Behaviormetrika, Cogent Psychology,*  
*Journal of Psychoeducational Psychology, Journal of Research in Education,*  
*Journal of Statistical Software, Psychological Test and Assessment Modeling,*  
*Frontiers in Neurology,*  
*Methodology – European Journal of Research Methods in Behavioral and Social Sciences*

**Reviewer** - Conference Proposals

American Educational Research Association	
Division D - Psychometrics, Measurement, and Assessment	2015-18
SIG - Cognition and Assessment	2015-19
SIG - Large-Scale Assessment	2016-17
National Council on Measurement in Education	
Annual Meeting	2016-18
Graduate Student Research Session	2015-16
<b>Annual conference session chair</b>	
NCME Annual Meeting	2017

**Others**

Faculty Search Committee, Inquiry Methodology, IU, member	2015-16
Workshop in Methods (WIM) Advisory Board, IU, member	2014-16
AERA Division D Membership Committee, student member	2014-15
Inquiry Brownbag Committee, IU, Vice President	2014-15
IUpsychometricians Research Group, founder and facilitator	2013-15
Inquiry Brownbag Committee, IU, Secretary	2013-14
Beijing Linguistics Association, Beijing, Secretary	2007-11

**PROFESSIONAL DEVELOPMENT**

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**Trainings and Workshops**

**The NAEP Database Training Seminar**, sponsored by the National Center for Education Statistics (NCES), Institute of Education Sciences (IES), and U.S. Department of Education, Washington, DC, 2012.

**Equipping Your Statistical Toolbelt: The Regression, ANOVA, etc. (GLM) workshop**, Indiana Statistical Consulting Center (ISCC), Bloomington, IN, 2012.

## **Certificates**

**Teaching Chinese as a Second Language**, the Committee for Certifying Qualification to Teach Chinese as a Foreign Language, 2005

**Machine Learning**, Coursera (<https://www.coursera.org/course/ml>), 2014