September 2020

Looking Back, Looking Ahead: Outcomes, Impacts, and Next Steps

UBC-Paragon Partnership, 2015 - 2020

Acknowledgements

- Thank you to Professor Anita Hubley, Dept. of ECPS, MERM Program, for her advice and support over the course of the partnership.
- Thank you for the continued support from Clara Ng, Assistant Dean, Finance; Ayaz Mahmood Director of Finance; and Anna Bin, Director, HR in the Dean's Office, Faculty of Education, UBC.
- We would like to thank the staff at Flying Leapfrog Corp. for support in our short- and long-term strategic planning, and communication strategies. URL: https://flyingleapfrog.com/

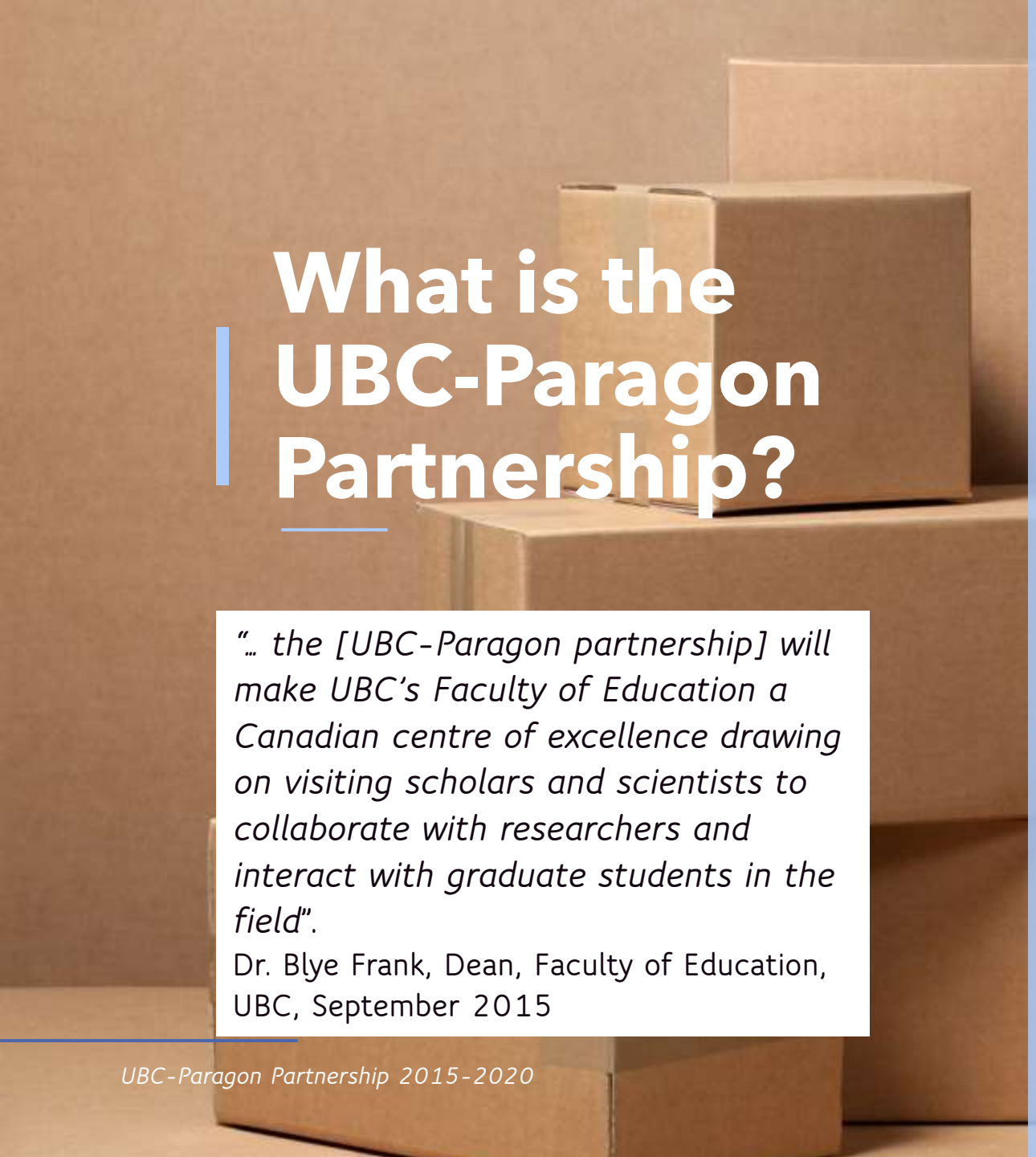
Envisioning and Achieving the Partnership

This industry-university partnership is the vision of Dr. Donald Wehrung, President and CEO at Paragon Testing.

I am grateful to Dr. Wehrung for his vision for and commitment to this partnership that led to the Professorship. His vision is a model of innovation through research collaboration and partnership between university researchers and industry.

The partnership between UBC and Paragon Testing is the first of its kind for the Faculty of Education and is unique in the world. I am thrilled to lead it.

Bruno D. Zumbo, Professor & Distinguished University Scholar,
Paragon UBC Professor of Psychometrics and Measurement, &
Tier 1- Canada Research Chair in Psychometrics and Measurement, UBC
August 2020



What is the UBC-Paragon Partnership?

"… the [UBC-Paragon partnership] will make UBC's Faculty of Education a Canadian centre of excellence drawing on visiting scholars and scientists to collaborate with researchers and interact with graduate students in the field".

Dr. Blye Frank, Dean, Faculty of Education, UBC, September 2015

In September 2015, Paragon Testing Enterprises, a subsidiary of the University of British Columbia (UBC), entered into a partnership with the University of British Columbia (Vancouver Campus), Faculty of Education and Office of the Provost.

Together Paragon and UBC invested $1.8 million over a period of five years to:

- enhance UBC's standing as a global leader in research and graduate student training in the statistical science of measurement.

UBC's Measurement, Evaluation, and Research Methodology (MERM) Graduate Program

The UBC-Paragon Partnership (a) created the Paragon UBC Professorship in Psychometrics and Measurement to lead the initiative and enhance the scholarly activity in the statistical theories of measurement, and (b) strengthened the masters and doctoral graduate programs in MERM through:

a) collaborative research projects;

b) support of faculty members, graduate students, post-doctoral fellows, and visiting scholars;

c) the exchange of scholarly information by collaborations, seminars and workshops;

d) a grant-tenure Assistant Professor for the term of the Partnership, 2015-2020.

To learn about the MERM Program, go to: https://ecps.educ.ubc.ca/measurement-evaluation-and-research-methodology/

Background image: Three MERM PhD graduates (L to R), Dr. Michelle Chen, Dr. Amery Wu, and Dr. Arwa Alkhalaf at the celebration of the launch of the partnership in fall 2015.

Outcomes of the UBC-Paragon Partnership

Outcomes During the Partnership - 5 years

Student Funding

20 MERM grad students funded for 1-4 years

4 undergrad students funded for 1-3 years

18 additional grad students in the Dept of ECPS were funded in summer 2020 to offset COVID

Pre- & Post-Doctoral Fellows

4 Post-Doctoral Fellows funded and supervised

1 Pre-Doctoral Fellow funded and supervised

Preparing Future Leaders

12 highly qualified personnel (post-docs and PhD students) were trained under the partnership for academic, government, and industry positions across the world

Grants

Professor Zumbo was awarded an additional $2.1 million in national grants, and $1.5 million in international grants during the partnership

Scholarly Output

Professor Zumbo authored 60 publications, 14 contributed chapters, 1 edited book, and delivered 20 invited addresses & colloquia at universities, international conferences and meetings during the partnership.

Canada Research Chair

In June 2020 Professor Zumbo was appointed the Tier 1 Canada Research Chair in Psychometrics and Measurement

Students and Post-doctoral Research Fellows

A Sample of Student Research Projects Under Dr. Zumbo's Supervision

- Keren Roded is doing research on item parameter drift. Item parameter drift is a key question in applying the calibration and equating/linking methods used by organizations such as Paragon.
- Dr. Pamela Woitschach, visiting scholar, from Spain and Paraguay was funded for psychometric research on item bias, invariance, and DIF.
- Mauricio Coronel is working on DIF methods for complex scoring and complex sample respondents, including gender and sexual identity as grouping characteristics.
- Donna (Naghmeh) Jahangir-Tafreshi, pre-doctoral research intern, worked on addressing a question that arose from Paragon Testing's R&D group about the number of options in multiple choice questions.

A Sample of where former post-docs and grad students are now

- Dr. Ed Kroc, a former post-doc, is now an Assistant Professor in the Faculty of Education, UBC
- Dr. Arwa Alkhalaf, a former Ph.D. student, is a Professor at the King AbdulAziz University, Jeddah, Saudi Arabia
- Dr. Oscar Olvera Astivia, former PhD Student and Post-doc, is now an Assistant Professor at the University of Washington
- Dr. Nathan Roberson, a former Ph.D. student, is an Assessment Specialist and Policy Analyst with the OECD in Paris, France
- Dr. Julie (Junli) Wei, a former post-doc, is now a Senior Research Analyst (Learning Analytics), Faculty of Arts, UBC

Additional Opportunities and Support for Graduate Students

- Additional financial support to present their research at national and international conferences
- Developed their computational skills working with faculty members to build interactive web tools using R for *Shiny* or *Jamovi*.
- These tools serve some of our graduate courses and research studies.

Impact of the Research Arising from the UBC-Paragon Partnership

Impact of the Research Outcomes from the Partnership

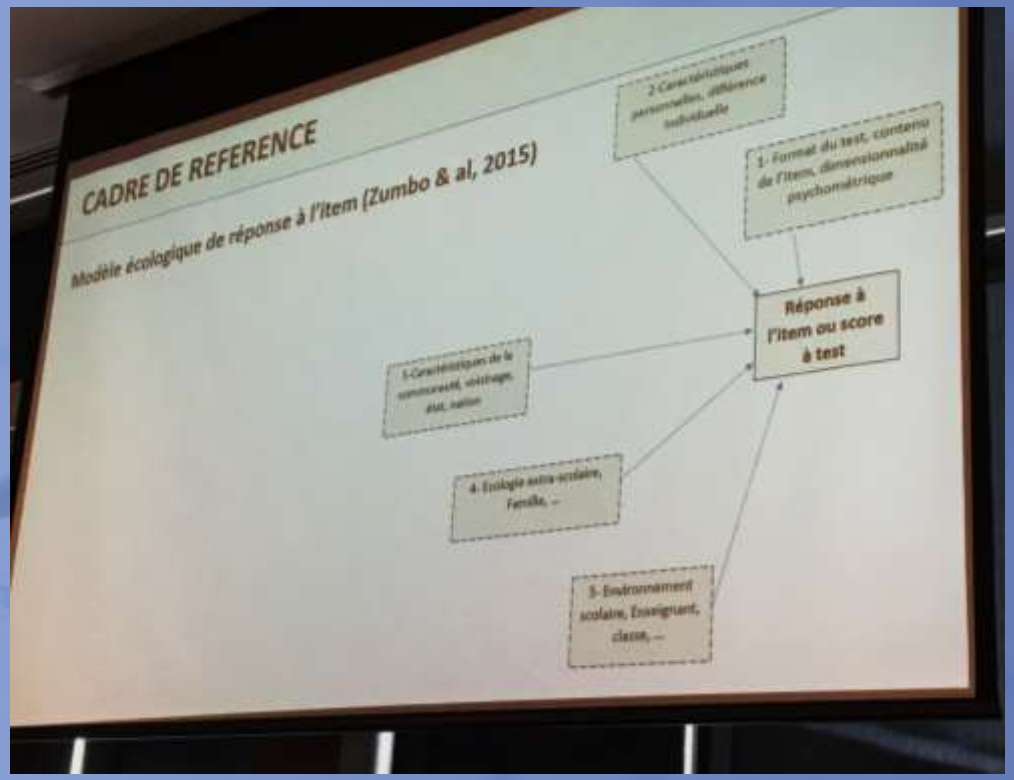
Over the first 5 years of the UBC-Paragon partnership, UBC has become a **centre of excellence** drawing new and established scholars from across Canada and around the world to advance the theory and practice of testing, measurement, psychometrics, and related mathematical sciences.

The UBC-Paragon partnership has fostered an environment where students and researchers can pursue their innovative interdisciplinary research ideas while engaging with industry leaders in testing and psychometrics.

An Example of the Impact of Research Outcomes from the Partnership

Ecological model of item responding

- Dr Zumbo is developing new mathematical and data science methods situated in his ecological theory of item and survey responding.
- The scale and ambition of contemporary survey and assessment programs with, in some cases, multiple countries, diverse cultural settings and languages raise many well-known challenges to measurement.
- Matters of questionnaire or item relevance, adaptation, and equivalence are paramount among these challenges.
    - Dr. Zumbo is motivated by questions of how effectively tests and questionnaires travel across place and time, and how they are received in diverse cultural and linguistic settings that are radically different from those in which they were produced.

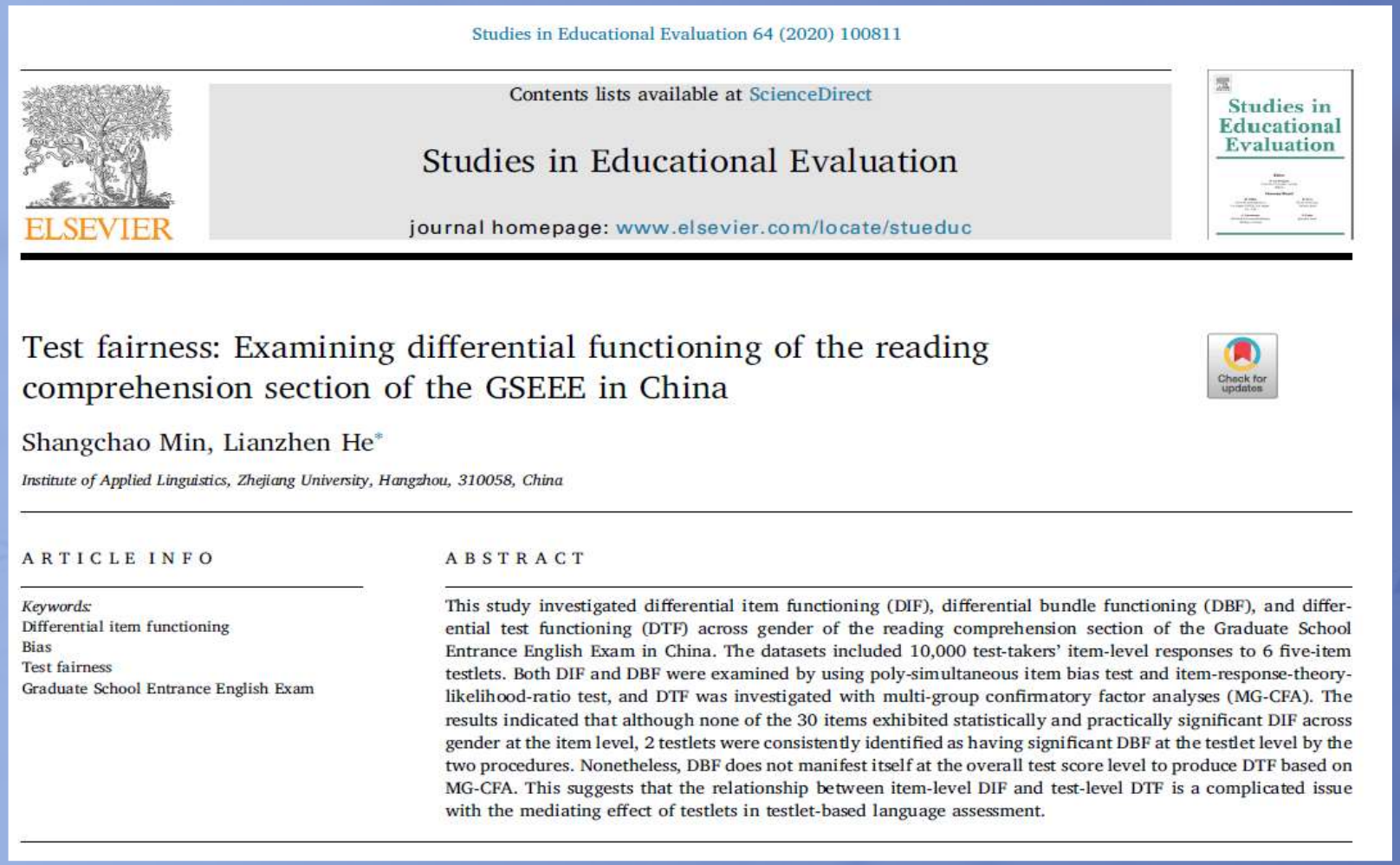


African researchers use Dr. Zumbo's ecological item response model to shape test validation research in Cameroon. [presentation at ADMEE 2019]

Impact of the Research Outcomes from the Partnership

Dr. Zumbo's work in item bias and test fairness is shaping on-going research in China.

Chinese researchers use the theory and methods developed by Dr. Zumbo and others to investigate potential gender bias of the reading comprehension section of the Chinese Graduate School Entrance English Exam



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Test fairness: Examining differential functioning of the reading comprehension section of the GSEEE in China

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ARTICLE INFO

Keywords:
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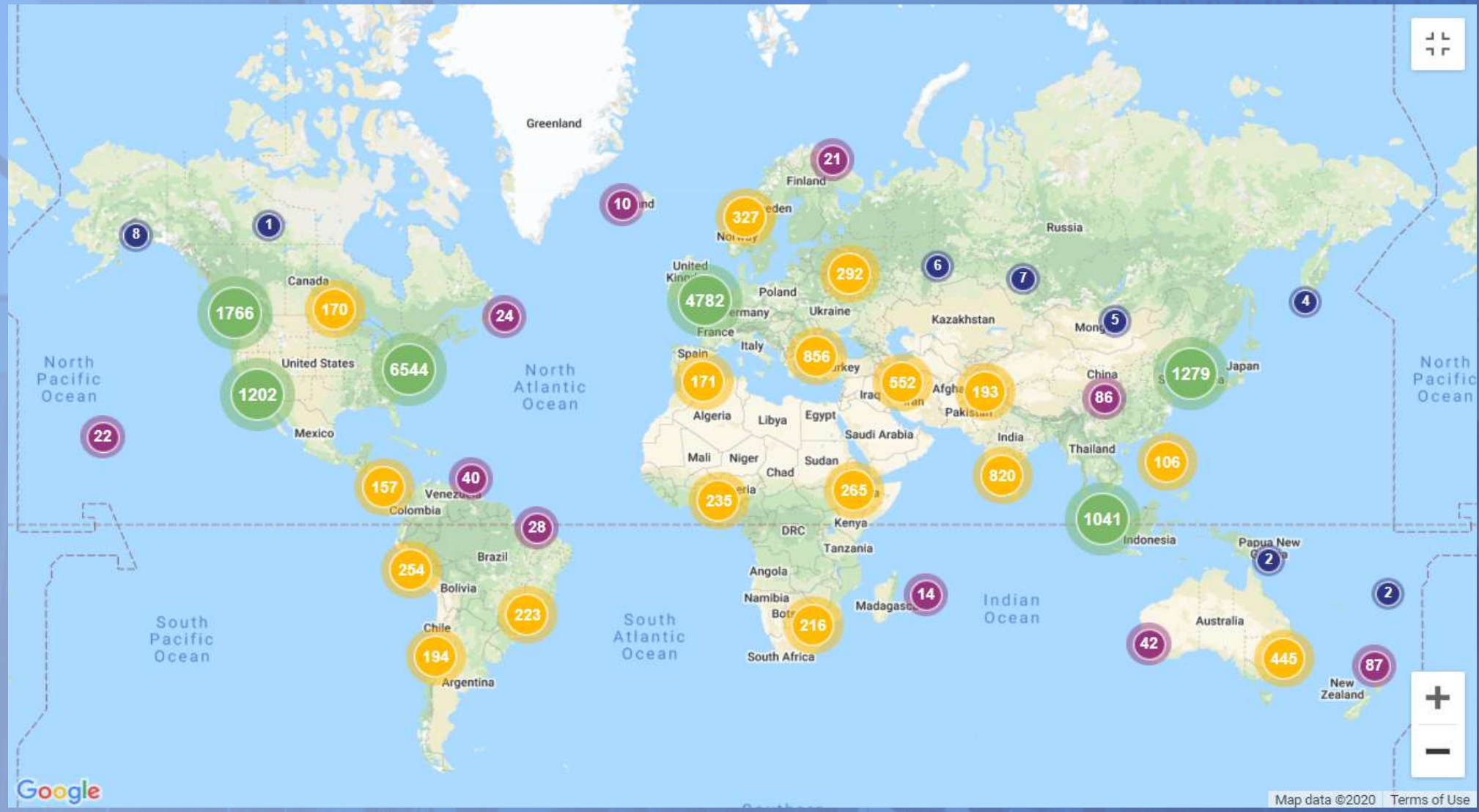
Graduate School Entrance English Exam

ABSTRACT

This study investigated differential item functioning (DIF), differential bundle functioning (DBF), and differential test functioning (DTF) across gender of the reading comprehension section of the Graduate School Entrance English Exam in China. The datasets included 10,000 test-takers' item-level responses to 6 five-item testlets. Both DIF and DBF were examined by using poly-simultaneous item bias test and item-response-theory-likelihood-ratio test, and DTF was investigated with multi-group confirmatory factor analyses (MG-CFA). The results indicated that although none of the 30 items exhibited statistically and practically significant DIF across gender at the item level, 2 testlets were consistently identified as having significant DBF at the testlet level by the two procedures. Nonetheless, DBF does not manifest itself at the overall test score level to produce DTF based on MG-CFA. This suggests that the relationship between item-level DIF and test-level DTF is a complicated issue with the mediating effect of testlets in testlet-based language assessment.

Global Usage Statistics of a Sample of Dr. Zumbo's Publications (2015 – 2020)



Collaborations with Paragon

Background image (L to R) Stephen Smith, Dr. David H. Farrar, and Dr. Donald Wehrung, all of whom were members of the Board of Directors of Paragon Testing, at the celebration of the launch of the partnership fall 2015.

Collaborative Research with Paragon Testing, MERM Grad Students Recruited by Paragon

Sample of Publications Resulting from Collaborations with Paragon Staff

- Li, Z., Banerjee, J., & Zumbo, B.D. (2017). Response Time Data as Validity Evidence: Has It Lived Up To Its Promise and, If Not, What Would It Take To Do So. In B.D. Zumbo and A.M. Hubley (Eds.), *Understanding and Investigating Response Processes in Validation Research* (pp. 159-178). New York, NY: Springer.
- Wu, A.D., Chen, M.Y., & Stone, J.E. (2018). Investigating How Test-Takers Change Their Strategies to Handle Difficulty in Taking a Reading Comprehension Test: Implications for Score Validation. *International Journal of Testing, 18(3)*, 253-275.
- Chen, M.Y., Liu, Y., & Zumbo, B.D. (2020). A Propensity Score Method for Investigating Differential Item Functioning in Performance Assessment. *Educational and Psychological Measurement, 80(3),* 476-498.

Sample of UBC MERM Graduates Recruited by Paragon Testing

- Dr. Michelle Chen, has worked for several years during her PhD studies and continued on staff in Test Research & Development, as well as Test Operations Divisions
- Adam Gesicki, Psychometrics Specialist, Test Operations and Test Research & Development
- Lok Chau, Psychometrics Specialist, Test Operations Division
- Keren Roded, Psychometrician, Test Operations Division
- Lucas J. Friesen, Associate Psychometrician, Test Operations Division

Collaboration with Paragon Testing - *where psychometric and mathematical science meet practice*

Knowledge Mobilization:

Collaborative research with Paragon Testing's psychometricians to address operational testing questions.

- As done across the industry, methods for test equating and scoring of listening and reading components of Paragon's language tests are used in its operational testing activities to place test takers onto a common IRT scale. Two recent collaborative studies to:
  - (i) investigate the robustness of concurrent calibration methods to changes in the location (mean) and scale (variance) of the test score distribution of CELPIP test takers, and
  - (ii) determine minimum sample sizes for which concurrent calibration remains consistent and sturdy.

Knowledge Dissemination and Exchange:

Sharing knowledge, experiences, and innovative ways of approaching complex questions and problems.

- Paragon staff attended seminars and the UBC-Paragon Speaker Series on advances in educational assessment, testing policy, and advanced psychometric methods such as item response theory (IRT) and generalizability theory.
- Collaborative conference presentations at international conferences on language testing (e.g., LTRC), and measurement (ITC, and NCME).
- Dr. Zumbo shared his knowledge and perspective gained over 30+ years of experience in testing and psychometric with Paragon leadership and staff.

Looking Forward

The Next Four Years of the UBC-Paragon Partnership

Background image (L to R) Dr. Anthony Paré, Dr. Ali Abdi, Dr. Anita Hubley, Dr. Ignacio Pedrosa, Dr. Kim Zebehazy at the celebration of the launch of the partnership fall 2015.

Looking Ahead, the Next Four Years

Building on the successes of the first partnership, a second partnership was established to continue to collaborate for the purpose of advancing research, supporting graduate student and post-doctoral training in the area of measurement and psychometric methods, and supporting Paragon Testing Enterprises' research and development activities.

UBC-Paragon Partnership 2020-2024

UBC-Paragon Living Lab

- The successes of the first partnership were the post-doc and graduate student support, and research engagement that led to an enriched community of scholars, prodigious scholarly output, and global impact.
- Building on these successes is the concept of the UBC Paragon Living Lab.
- The Living Lab, designed and directed by Dr. Zumbo, allows for a continuity of research and teaching that will enhance the research experience for post-doctoral fellows and graduate students.

Chief Scientific Officer at Paragon Testing

- The continuity is fostered by the fact that, as part of the shared funding arrangement between the two Parties, Dr. Zumbo will also serve as the Chief Scientific Officer at Paragon for the equivalent of one day per week.
- The role of CSO will fully embed the activities of the graduate students and post-doctoral fellows in Paragon's test research and development.
  - Students and post-docs will engage with scholars at UBC and abroad to gain direct experience, develop skills, increase knowledge, and build their capacity to contribute to the research and development community.

We look forward to the next four years of the UBC-Paragon Partnership 2020-2024

To learn more or if you are interested in the research arising from the UBC-Paragon partnership, please reach out by email to Dr. Bruno Zumbo, at UBC.
bruno.zumbo@ubc.ca

Click on the image below to view the Youtube video in your web browser