PROMS2016 symposium was held in Xi’an, China, from July 30–August 3, 2016, with pre-conference workshops scheduled for July 30–31, 2016. And the present conference proceeding is done ad hoc for the researches, Ph.D. supervisors, educators, practitioners, and younger generation who seek to use the Rasch Model in their research activities in Pacific Rim countries, regions, and beyond.

More than half a century has passed since the Danish mathematician Georg Rasch (1901–1981) published his “Probabilistic Model for Intelligence and Attainment Tests” (Rasch 1960). With this departure, the model has been finding a wide application in measuring variables ranging from business, counseling, economics, education, health care, language testing, measurement, psychology, quality assurance, statistics to strategic planning field and has been extended from the initial application to dichotomous data type to the polytomous ones. Today, the model is held as “Rasch Model” among measurement professionals and believed to have instigated the vision of promoting objective measurement and to have contributed greatly to scientific discovery.

To this end, Pacific Rim Objective Measurement Symposium (PROMS) has been devoting all their endeavors over the past decade and PROMS conferences have been successfully hosted in many Pacific Rim countries and regions for such a purpose of promoting the research and contributing to the development of the Rasch Model. PROMS2016 Xi’an, China, is the twelfth symposium and follows highly successful meetings in PROMS2005 Kuala Lumpur; PROMS2006 Hong Kong; PROMS2007 Taiwan; PROMS2008 Tokyo; PROMS2009 Hong Kong; PROMS2010 Kuala Lumpur; PROMS2011 Singapore; PROMS2012 Jiaxing, China Mainland; PROMS2013 Kaohsiung, Taiwan; PROMS2014 Guangzhou, China Mainland; and PROMS2015 Fukuoka, Japan. To quote Prof. Rob Cavanagh, the Chair of PROMS, there are many good reasons why researchers should attend PROMS: “The keynote speakers and workshop presenters are all eminent scientists with cutting-edge expertise in Rasch measurement and its applications; students are encouraged to attend and present their work. The atmosphere is highly collegial and we value the contributions of all; PROMS is highly supportive of early career researchers, and the professors who attend are renowned for the support they
provide for all participants”; therefore, anyone seriously interested in research and
development in the field of psychometrics or measurement will find such an
international symposium and related workshops to be an excellent source of
information about the application of the Rasch Model.

The present volume contains 18 articles germane to Rasch-based research work
submitted by scholars from PROMS2016. Each of these articles deals with Rasch
measures in their research field, covering a variety of issues ranging from education,
psychology, management, language testing to medicine and serving in particular as
good resources for researchers and students to be able to conduct their own Rasch
Model analyses as well as understand and review published Rasch-based research.

Prof. Quan Zhang Ph.D.
Senior Visiting Scholar to ETS, Princeton, USA;
Senior Research Scholar at UCLA, USA;
Chair Professor and Director, Institute of Language Testing,
University of Jiaxing, Zhejiang Province, P. R. China;
Ph.D. Supervisor, City University of Macau, SAR, China;
Ph.D. Supervisor, DEEP University Wisconsin, USA
Acknowledgements

Our sincere thanks go to all the contributors for their time and efforts made to have this book a reality. And we should thank the Springer for publication; we also express our sincere gratitude to the MetaMetrics, USA, who has been acting as a great sponsor for PROMS each year and City Training Institute (CTI) Guangzhou over the past years as well.

In particular, we appreciate the quality control procedures for paper review proposed and practiced by Prof. Trevor Bond and Prof. Rob Cavanagh this year. We are fully aware that presentations at PROMS are ephemeral; the Proceedings provide permanent public evidence as to what and who PROMS are, and what PROMS think is good enough. In this sense, the PROMS 2016 Board Meeting decided to raise the academic standard of the Proceedings by implementation of a peer review process. For inclusion in the Proceedings, prior to inclusion in the Proceedings, each submission is subject to a three-stage review process. First, an abstract is submitted prior to the symposium. This is blind reviewed by two PROMS Board Members. Following notification of authors, work deemed of sufficient relevance and quality is forwarded to the Organizing Committee for scheduling in the Symposium program. At the conclusion of the Symposium, presenters are invited to submit a report on their research for publishing. Each of the submitted reports is blind reviewed by two members of the PROMS Board of Management. The results of this process are communicated to authors. The successful authors are invited to respond to the recommendations of the reviewers by amending their script and submitting a revised version for the third stage of reviewing. In the third stage, another board member of PROMS evaluates the revised script and works with the author to rectify minor errors. The final scripts are then collated by the Proceedings Editor and forwarded to the Springer for publication. We wish to thank the following scholars for reading one or more papers: Trevor Bond, Rob Cavanagh, William P. Fisher Jr., Zi Yan, Aaron Batty, Mohd Zali Mohd Nor, Jeffrey Durand, and Quan Zhang; Rasch study is by no means an easy field. Their scholarship has been invaluable. While they save us from a number
of inaccuracies and infelicities, they can in no way be held responsible for the 
academic opinions which are expressed and the imperfection which no doubt 
remains.

Copies of the present book will be sent to universities and colleges in Pacific 
Rim countries and regions as well as Europe and other parts of the world. In doing 
so, we are confident to claim that the past decade of PROMS has been rewarding. 
The retrospect is impressive, and the prospect is promising. And we are looking 
forward to the success of PROMS2017, Sabah, Malaysia!
The PROMS Board of Management comprises academics and researchers who oversee the maintenance of the culture and traditions of PROMS. This includes championing the application and dissemination of the Rasch Model and modern measurement theory. In addition to the chair and deputy chair, members include advisors and contributors invited by the board, one representative from each country or region involved in PROMS, and members of the organizing committee for the next symposium.

**Chair**
Prof. Rob Cavanagh, Curtin University, Australia

**Past Chair**
Prof. Trevor Bond, James Cook University, Australia

**Deputy Chair**
Prof. Zi Yan, The Education University of Hong Kong, Hong Kong, SAR, China

**Second Deputy Chair**
Prof. Jeff Durand, Toyo Gakuen University, Japan

**Secretary/Mainland Chinese Delegate**
Prof. Quan Zhang, Jiaxing University, China

**Malaysian Delegate**
Dr. Mohd Zali Mohd Nor, Newstar Agencies Sdn Bhd, Malaysia
USA Delegate
Prof. George Engelhard, University of Georgia, USA

Singaporean Delegate
Dr. Iris Lee, Ministry of Education, Singapore

Hong Kong Delegate
Prof. Wen Chung Wang, The Education University of Hong Kong, SAR, China

Web Administrator/Japanese Delegate
Dr. Aaron Batty, Keio University, Japan

Board Advisors
Prof. Jackson Stenner, MetaMetrics, Inc., USA
Dr. William P. Fisher, Jr., MetaMetrics, Inc., USA, and Living Capital Metrics, USA

PROMS2016 Local Committee

The Local Committee, headed by Prof. Quan Zhang, comprises a team of student volunteers who did the actual work, i.e., conference promotion, implementation and organizational details, conference budget.

Chairs
Quan Zhang
Qian Shuangtian

Members
Shuangtian Qian (CTI, Guangzhou)
Xiaoxi Hu (CTI, Guangzhou)
Pei-sha Wu (CTI, Guangzhou)
Xiao-feng Zhang (CTI, Guangzhou)
Chaoran Yang (CTI, Guangzhou)
Wei-jun Wang (Shaanxi Provincial TV and Broadcasting Station)
Xiaomei Hu (Shaanxi Provincial TV and Broadcasting Station)
Duanni (Southern Medical University)
And student volunteers of City Training Institute (CTI), Guangzhou, Jiaxing University and Xi’an Jiaotong University
Sponsors and Donors for PROMS2016, Xi’an, China

A Great Success for PROMS2016, Xi’an, China
With sponsorship from

Welcome Message from PROMS2016 Xi’an

From Prof. Quan Zhang, Ph.D.
PROMS2016 host
Senior Visiting Scholar to ETS
Senior Research Scholar at UCLA
Director, Institute of Language Testing, University of Jiaxing, Zhejiang Province, China
Ph.D. Supervisor of City University of Macau, SAR, China
Ph.D. Supervisor of DEEP University, Wisconsin, USA

I’m very delighted to announce that the PROMS Board has decided the PROMS2016 symposium will be held in Xi’an, China, from August 1–3 2016 with pre-conference workshops scheduled for July 30–31, 2016, and post-conference self-arranged events scheduled from August 4, 2016.

Over the past years, PROMS has been successfully hosted in many Pacific Rim countries and regions for the purpose of promoting the research and contributing to the development of the Rasch Model. Following the inaugural PROMS2012 held in Jiaxing, Zhejiang Province, China Mainland, and PROMS2013 Kaohsiung, PROMS2014 Guangzhou, and PROMS2015 Fukuoka, we are now opening our arms to welcome all PROMS counterparts to Xi’an, China.
Just as a Chinese proverb goes, reviewing the old always helps learn something new. In 1960, the Danish mathematician Georg Rasch (1901–1981) published his “Probabilistic Model for Intelligence and Attainment Tests” (Rasch, 1960). Since then, the model has been finding a wide application in measuring variables ranging from education to medicine field and has been extended from the initial application to dichotomous data type to the polytomous ones. Today, the model is held as “Rasch Model” among measurement professionals and believed to have instigated the vision of promoting objective measurement and to have contributed greatly to scientific discovery.

In China Mainland, the most significant research work based on Rasch Model is the ten-year-long (1990–1999) Equating Project for Matriculation English Test (MET) conducted under the guidance of Prof. Gui Shichun, my Ph. D. supervisor, during 1980s. The MET equating results received praise and adulation at home and abroad, but the following years did not witness any significant Rasch-based application, research, and event. However, PROMS2012 held in Jiaxing, China, greatly helps Rasch Model and relevant research regain potency. In Hong Kong, headed by Prof. Magdalena Mo Ching Mok of Hong Kong Institute of Education, 45 highly competent translators working in 13 different organizations, universities, or institutes located, respectively, in China Mainland, Hong Kong, Macau, and Taiwan have successfully translated into both simple and classic Chinese two volumes of books each containing 205 abstracts from Journal of Applied Measurement (JAM), each of these abstracts dealing with Rasch measures in their research field, covering a variety of issues ranging from education, psychology, management, testing to medicine and serving in particular as good resources for researchers and students of non-English majors in China Mainland, Hong Kong, Macau and Taiwan to be able to conduct their own Rasch Model analyses as well as understand and review published Rasch-based research.

With this in mind, we take PROMS2016 symposium as an important event to further promote as well as provide an excellent introduction to the Rasch Model and its application. As a host, while following the common practice of PROMS, we also offer something unique to meet the practical needs of participants in China. At the first place, pre-conference workshops will be run in bilingual, i.e., in both English and Chinese, and one workshop is run in Chinese only to meet the needs of beginners and students of non-English majors. Second, in particular, we arrange a “Meet the Keynotes” Session. This reduces the number of papers presented concurrently but increases attendance, sharing of work, learning from others, and giving more time for questions and answers between professionals and novices. Apart from this, PROMS2016 symposium in Xi’an would be of great benefit to all participants in terms of paper publication. PROMS2012 and PROMS2014 Proceedings have been officially published by the Springer, and PROMS2015 is under editing for publication by the same press. All will be included by CPCI.

Anyone seriously interested in research and development in the field of psychometrics or measurement will find such an international symposium and related workshops to be an excellent source of information about the application of the Rasch Model.
Finally, I should say the city that the PROMS2016 organizers have chosen is unique for both the history and the local cuisine. Xi’an is an ancient city with eleven dynasties in Chinese history and famous for Terre Cotta Warrior and Horse of the Qin Dynasty dating back approximately over 2000 years.

My dear Rasch counterparts, you come, you learn, and you love! We look forward to meeting you in Xi’an, China!

Institute of Language Testing, University of Jiaxing, is an equal opportunity employer and does not discriminate on the basis of race, gender, religion, sexual orientation, nationality, or any other factors not related to individual professional qualifications. © PROMS2016

Invitation to PROMS2016, Xi’an, China

Professor Rob Cavanagh (Ph.D.)
Chair of the PROMS Board of Management
Director, Research and Development, School of Education
Curtin University, Australia

On behalf of the Board of Management of the Pacific Rim Objective Measurement Society, it is my pleasure to invite you to attend the 2016 symposium in Xi’an, China. PROMS2016 is the twelfth symposium and the third in China Mainland; all have been a resounding success as will the Xi’an event.

The function of PROMS could be broadly described in terms of educative support for doctoral and early career researchers, in conjunction with dissemination of information on cutting-edge developments in human science measurement and metrology. The academic contribution comes from the sharing of knowledge between PROMS senior scientists, keynote speakers, and PROMS members delivering reports on their projects in the paper sessions. The sessions in which emergent and ongoing research projects are presented are particularly valuable; these are characterized by a highly friendly supportive atmosphere and a genuine concern for the presenter and the work presented.
The keynote addresses and the speakers have been chosen very carefully. They have enviable reputations in fields including theoretical aspects of measurement, the design and calibration of measures, leadership within the measurement community, research training, and of course the Rasch Model and its applications. All will be available throughout the program and are most willing to provide advice and to collaborate with delegates.

Another way PROMS provides research training is through the pre-symposium workshops. A two-day program of hands-on workshops with tailored software and delivery in Mandarin is offered. These are highly interactive, and participants will be using commercial quality software and data from reputable sources.

The decision for Xi’an to be the venue for PROMS2016 is most commendable. This is a fantastic city with facilities and attractions to complement the serious business of PROMS.

Finally, our extreme gratitude needs to be expressed to Prof. John Zhang (Ph.D.), who again, for the third time, is convening PROMS in China.

**PROMS2016 Pre-conference Workshops**

In accordance with the international conference practice, each PROMS program is preceded by two days of workshops. These typically provide research training on: the basics of Rasch measurement using Winsteps; measuring English language performance with Lexiles; many-facet Rasch measurement using FACETS; computer adaptive testing; evaluating the quality of performance assessments; constructing measures; and multidimensional Rasch Models. Listed below are four pre-conference workshops conducted from July 30–31, 2016, Xi’an, China.

**Pre-conference Workshop I. July 30–31, 9:00 am–17:30 pm**

**Introduction to Rasch Measurement Using Winsteps**

This is a dual language (English/Chinese) practical workshop jointly run by Prof. Trevor Bond and Yanzi and Dr. Chan Wai Fong in both Chinese and English to introduce colleagues to Rasch measurement using Winsteps software. Theoretical and procedural presentations are followed by guided hands-on data analysis and interpretation. Participants were told to bring their own laptop computers (with Office and Adobe Reader pre-installed).

Prof. Trevor Bond introduced PROMS to Asia in 2005, the lead author of the best-selling book, “Applying the Rasch Model.” Prof. Zi Yan of the Education University of Hong Kong is specialized in educational assessment and applying Rasch analysis in education and psychology issues. Dr. Wai Fong Chan is an infection preventionist who applies Rasch measurement in her field. Dr. Chan is currently the Local Advisor of Squina International Centre for Infection Control and Adjunct Assistant Professor at The Hong Kong Polytechnic University.
Pre-conference Workshop II. July 9:00–12:00, 2016
Substantive Theory General Objectivity and an Individual-Centered Psychometrics

This workshop run by Prof. Jack Stenner, Chief Scientist-MetaMetrics, focuses on Substantive Theory General Objectivity and an Individual-Centered Psychometrics. According to Prof. Jack Stenner, we argue that a goal of measurement is general objectivity: Point estimates of a person measure (height, temperature, and reader ability) should be independent of the instrument used and independent of the sample in which the person happens to find herself. In contrast, Rasch’s concept of specific objectivity requires that only differences (i.e., comparisons) between two person measures are independent of the instrument. We present a canonical case in which there is no overlap between instruments and persons: each person is measured by a unique instrument. We then show what is required to estimate measures in this degenerate case. The canonical case forces a simplification and reconceptualization of validity and reliability. Not surprisingly, this reconceptualization looks a lot like the way physicists and chemometricians think about validity and measurement error. We animate this presentation with a technology that blurs the distinction between instruction and assessment and results in generally objective measures of reader ability. The second half of the workshop will focus on participants’ favorite constructs and how generally objective measurement systems can be created. The distinction between descriptive and causal Rasch Models will be emphasized.

Pre-conference Workshop III. 9:00–12:00 July 30, 2016
An Introduction to the Analysis of Data

Prof. John Barnard, EPEC, Executive Director, John@epecat.com, the founder and Executive Director of EPEC Pty Ltd (http://www.epecat.com), a private company in Melbourne, Australia, that specializes in psychometrics and online assessment. He has extensive experience in assessment, from pioneering the implementation of IRT in South Africa and publishing CATs for selection of students in the 80s before migrating to Australia in 1996 where he has been active in numerous national and international projects.

He holds three doctorates and dual appointment as professor. He is a full member of a number of professional organizations, is the latest a founding member of IACAT, is elected as Vice President in 2014 and will become President in 2015. He is also a member of the International Assessments Joint National Advisory Committee (IAJNAC), a consulting editor of JCAT, and a member of the International Editorial Board of the SA Journal of Science and Technology. His most recent research in online diagnostic testing is based on a new measurement paradigm, Option Probability Theory, which he has been developing over the past decade.

In this workshop, participants will be introduced to the analysis of data within the frameworks of classical test theory (CTT), Rasch measurement, and item
response theory (IRT). Following an overview of essential concepts such as item difficulty, item discrimination, reliability, standard error of measurement, information functions, some real data sets will be analyzed from different perspectives. Some strengths and weaknesses of the different approaches will be discussed, and pitfalls, the treatment of missing data, etc., will be highlighted. Although the presentation will be in the form of demonstrations and discussion, participants will also have the opportunity to participate using data sets that will be provided. Depending on the interest of participants, different modes of test administration, e.g., linear, computerized adaptive testing (CAT) and option probability theory (OPT), to collect data can be included.

Pre-conference Workshop IV. July 30, 9:00 am–17:30 pm
Application of Many-Facet Rasch Model in Language Assessment: An Introduction

Run by Dr. Jason Fan who gave a full introduction to Application of Many-Facet Rasch Model in Language Assessment in Chinese. According to Prof. Jason Fan, recent years have witnessed the increasingly extensive application of Many-Facet Rasch Model (MFRM) in performance assessment (e.g., writing, speaking) research, thanks to its unique advantages. The purpose of this workshop is to walk you through the fundamental concepts in MFRM and demonstrates with facets as the software and authentic research data the applications of MFRM in language assessment research.

The workshop consists of the following components:

- Fundamental concepts in MFRM analysis and the weaknesses of traditional rating research,
- Preparing for a MFRM analysis,
- Interpreting output (e.g., variable map, separation statistics, global model fit, as well as output at each measurement facet such as rater, examinee, and task),
- Checking the utility of rating category structure,
- Interaction analysis.

This workshop was conducted in Chinese. Workshop participants were told to bring their own data and analyze it during the workshop. Before attending this workshop, participants can download the free software Minifac from http://www.winsteps.com/minifac.htm.
PROMS2016 Keynote Speakers

Trevor G. Bond, Adjunct Professor, James Cook University, Australia

Prof. Zi Yan, Associate Professor, The Education University of Hong Kong, Hong Kong SAR, P.R.China

Exporting to China: The future of a Genuine Collaboration with the West
Trevor G. Bond and Zi Yan

While Chinese producers are often regarded as mere copyists, many of the “copies” are of outstanding products, and, often, the copies exceed the originals. Recently, the industry slogan “Made in China” has been changed to “Made with China,” which emphasizes the new approach to industry collaborations between China and the rest of the world. So, why has the uptake of modern test theory, in general, and Rasch measurement, in particular, been so slow in the middle kingdom? Can it be just resistance to the new? Exacerbated by the dominance of traditional measurement approaches in the professoriat? This paper reviews the status quo of Rasch measurement in China and then provides two examples of collaboration between China and the West. One is the circuitous path taken to the publication of a key
Rasch measurement text for the Chinese market. The other is the successful experience of PROMS in China. Suggestions are provided for establishing genuinely collaborative research partnerships to promote the adoption of Rasch measurement in China.

Prof. Xiaoting Huang Ph.D.

Division head, Educational Evaluation Division, China Institute for Educational Finance Research (CIEFR), Peking University, Beijing, China

Prof. Huang studied Quantitative Methods and Evaluation at University of California, Berkeley (UC Berkeley), and graduated with Ph.D. in Education in 2010. She got her MA degree in Education at UC Berkeley in 2007 as well. Prof. Huang’s research interests cover measurement: test construction and validation (including item development, item analysis, reliability and validity analysis), item response modeling (unidimensional and multidimensional item response modeling), and statistics, especially in application of hierarchical/multilevel modeling in large-scale educational data analysis value-added models to evaluate school efficiency. She has conducted many important research projects and published annually research papers and books home and abroad.

Investigating the Predictive Validity and Social Consequences of “Gao-kao”
Xiaoting Huang

(China Institute for Educational Finance Research, Peking University, China)

The Chinese College Entrance Examination (“Gao-Kao”) is the highest stake assessment in China and parallels the most competitive examinations globally. As universities base their admission decisions solely on students’ test scores up till now, the test’s reliability and validity can never be overemphasized. Although China’s NEEA (National Education Examinations Authority) exerts great effort to ensure the quality of the examination questions and the reliability of the test, empirical studies on its consequence validity are scarce due to the lack of data. In this report, we analyzed University K’s 2004–2009 cohort data to examine the
validity of Gao-Kao score for predicting college success. Furthermore, we investigated the equity implications of the test between rural and urban residents, males and females, and between “super high school” and the regular school students. In addition, we examined the predictive validity and social consequences of University K’s independent recruitment examination. Our results suggested that (a) Gao-Kao score was a fairly good predictor of the freshmen grade; (b) the score usage had a negative impact on rural students; (c) different gender group performance was similar; (d) “super high schools” students were very much advantaged; however, students from these high schools did not perform significantly better in their first college year; (e) University K’s independent recruitment efficiently selected students with better academic performances and achieved better gender balance, but was even more favorable to urban residents than Gao-Kao. In the new round of “Gao-Kao” reform, we suggest to establish a monitoring system on the impact of test score usage, through which policy makers may find the best balancing point between efficiency and equity.

Prof. Jack Stenner

Chairman, CEO, and Co-founder of MetaMetrics Inc. President of the Board of Directors of Institute of Objective Measurement, a board member for the National Institute for Statistical Sciences, and a past board member for Duke Children’s Hospital and the North Carolina Electronics and Information Technologies Association, USA.

Substantive Theory General Objectivity and an Individual-Centered Psychometrics
Prof. Jack Stenner

We argue that a goal of measurement is general objectivity: Point estimates of a person measure (height, temperature, and reader ability) should be independent of the instrument used and independent of the sample in which the person happens to find herself. In contrast, Rasch’s concept of specific objectivity requires that only differences (i.e., comparisons) between two person measures are independent of the
instrument. We present a canonical case in which there is no overlap between instruments and persons: Each person is measured by a unique instrument. We then show what is required to estimate measures in this degenerate case. The canonical case forces a simplification and reconceptualization of validity and reliability. Not surprisingly, this reconceptualization looks a lot like the way physicists and chemometricians think about validity and measurement error. We animate this presentation with a technology that blurs the distinction between instruction and assessment and results in generally objective measures of reader ability. The second half of the workshop will focus on participants' favorite constructs and how generally objective measurement systems can be created. The distinction between descriptive and causal Rasch Models will be emphasized.

Jamie Dunlea, a Senior Researcher for the Language Assessment Research Group at the British Council, based in London. Jamie joined the British Council in 2013, after spending 23 years in EFL education, test development, and assessment research, and was previously Chief Researcher at the Eiken Foundation, a not-for-profit provider of EFL examinations in Japan. Jamie has experience in using the Rasch Model for both ongoing operational analysis of large-scale testing programs and research and validation projects such as applying MRFM to an investigation of the impact of rater and test taker language background variables on rater performance and in a large-scale international field trial for the validation of revised rating scales for the Aptis testing program.

Applying the Rasch Model in an Operational Language Testing Program
Jamie Dunlea

(Language Assessment Research Group at the British Council, London)

This speech will discuss the use of the Rasch Model in the context of an operational language testing program. The presenter is an experienced language testing researcher, with over 15 years of operational test development experience, but as a practitioner, rather than a theorist, will speak from the perspective of operational
decisions. All test development and validation involve balancing a number of often seemingly competing variables, leading Bachman to refer to testing as the “art of the possible.” This implies making practical decisions and adjustments to arrive at processes and results which are useful. But achieving a balance between competing needs may also mean leaving all sides less than 100% satisfied. The speaker will discuss issues encountered using Rasch for pretesting and the use of item difficulty estimates and fit indices in making quality control decisions and in pre-equating. The paper aims to raise questions and generate discussion rather than provide solutions or definitive answers.

PROMS2016 Invited Speakers

Prof. Wen Chung Wang

Director of Assessment Research Centre and Chair Professor, Department of Psychological Studies, The Educational University of Hong Kong

Analyses of Testlet Data

Testlets, which are defined as a set of items linked by a common stimulus, are commonly used in educational and psychological tests. Such a linkage may make items within a testlet locally dependent. There are three major approaches to testlet-based items. First, one can fit standard item response theory (IRT) models and ignore the possible local dependence. Second, one can transform items in a testlet into a super (polytomous) item and then fit polytomous IRT models to the transformed data. Third, one can fit testlet response models that were developed to account for the local dependence. This study compared the performance of these three approaches in recovering person measures and test reliability through simulations. It was found that the polytomous-item approach performed highly satisfactorily when data were generated from testlet response models or when data had chain effects between adjacent items. In contrast, fitting standard item response models tended to result in overestimation of test reliability when data were
generated from testlet response models and underestimation or overestimation of test reliability when the data had chain effects. Likewise, fitting testlet response models might result in underestimation or overestimation of test reliability when the data have chain effects. Thus, if person measures as well as their measurement precision (test reliability) are the major concern, the polytomous-item approach is recommended.

**Keywords** Testlet response theory, item response theory, local independence, chain effect, polytomous items

Dr. Haniza Yon

President of the Malaysian Psychometrics Association

Dr. Haniza Yon successfully set up the first psychometrics laboratory in Malaysia in 2009. As Head and Research Director of the Psychometrics Cluster at a national research institute in Malaysia, she remains responsible for overseeing the technical work related to its psychometrics programs. The cluster’s activities focus on various kinds of educational and psychological testing, and tests developed by the cluster have been used as a basis for awarding scholarships and recruiting members of Malaysia’s public safety workforce. Among Dr. Haniza’s qualifications is a Ph.D. in Measurement and Quantitative Methods from Michigan State University in the USA. She worked as a psychometrician on several globally renowned testing programs, such as the Advanced Placement (AP) examination and the College Level Examination Program (CLEP), at Educational Testing Service (ETS) of Princeton, New Jersey, USA, for several years before returning home to Malaysia. Her past work experience also includes several years at the Ministry of Education, Malaysia. Over the years, Dr. Haniza has been involved in many research projects in the fields of measurement and psychometrics. She has authored or co-authored over 50 research papers and technical reports, most of which were presented at international conferences. She is currently a member of several technical advisory committees, providing expert advice on educational testing and measurement issues for national and international projects. Her primary research interest lies in applications of modern psychometric methods in psychological and
educational testing, including the areas of computerized adaptive testing and intelligent essay scoring.

**Development of an Automated Scoring System for English Essays Using Latent Semantic Analysis**

Automated essay scoring (AES) has been of interest to language educators and researchers for decades, and many commercial AES systems are currently being used in educational testing and other fields. This presentation describes the development of an automated essay scoring system using the Latent Semantic Analysis (LSA) approach. A sample of 1024 eleven-year-old students from primary schools in Malaysia was recruited to answer two parallel forms of an English test comprising a mixture of essay and multiple-choice questions, and the essay questions on the test were scored by a panel of raters. The scores were then analyzed using FACETS, a multifaceted Rasch analysis programme that provides estimates of rater severity and consistency. Adjusted scores from the analysis of the students’ essays were used in the further development of the AES system. Cross-tabulation of adjusted essay scores obtained using linear regression and cosine similarity calibrated methods with grades obtained from Rasch analysis of students’ responses to the multiple-choice questions demonstrated that the AES system could accurately classify students according to their ability level. In the future, the AES system may also prove useful in helping Malaysian students improve their English writing skills. Promising results from this study and others being carried out around the world suggest that AES is a powerful approach with the potential to become a highly effective educational tool.

![Rie Koizumi Juntendo University, Japan, the Secretary General of the Japan Language Testing Association (JLTA)](image)
Multifaceted Rasch Analysis in Rating Tasks in Japan’s University Entrance Examinations

Japan is to implement drastic changes in its university entrance examination systems, beginning mainly in 2020. This presentation will explain the plans for these changes, particularly in terms of the introduction of open-ended tasks, which usually require raters to perform judgments using rating scales. I will then summarize how multifaceted Rasch analysis may contribute to test development and scoring in terms of rater training, rating scale development and revision, and rating quality maintenance covering previous research by myself and others. I argue that effective methods in this area may help Japan’s university entrance examination systems transit smoothly from the current multiple-choice oriented tests to tests comprising varied formats that can elicit more diverse knowledge, skills, and abilities and may help sustain the system improvements.

Rie Koizumi is an Associate Professor of English at Juntendo University, Japan. She is the Secretary General of the Japan Language Testing Association (JLTA). She has extensively taught undergraduate, postgraduate, and teacher-training courses on second language testing and assessment.

China Needs PROMS

Speech made by Prof. Qian Shuangtian representing City Training Institute (CTI) Guangzhou at Welcome Dinner

August 1, 2016, Xi’an

Dear and respected Prof. Rob Cavanagh, Trevor Bond, and Jack Stenner,
Dear and respected Prof. Tim McNamara and Prof. Jamie Dunlea,
Dear and respected Prof. Huang Xiaoting, Prof. Wang Wen-chung and Prof. Yanzi and Dr. Zali,
Distinguished guests, professors, experts,
Ladies and gentlemen,
Good evening!

In this passionate summer season, PROMS symposium once again comes to China, and this time it is held here in Xi’an. We are very happy because this is another gold opportunity for us to learn from and communicate with Rasch experts. City Training Institute (CTI) Guangzhou began to attach importance to PROMS and financially supported the conference since 2014. Here, on behalf of GTI Education Group as well as on my personal behalf, I’d like to take this chance to express our congratulations and welcome! We will continue to support such a conference and make contributions to let Chinese researchers join the world and let the world know the ongoing research of Rasch in China!

Historically, Xi’an is the ancient capital cities of thirteen dynasties, among which the four most prosperous dynasties, Zhou Dynasty, Qin Dynasty, Han Dynasty, and Tang Dynasty, made their capitals here in Xi’an; therefore, Xi’an is a
city of greater historical and cultural importance in China. People here have been enjoying good education, economic prosperity, social harmony, and social stability. Apart from this, “Xi’an snacks” or “Xi’an Dimsum” in the Muslim community somewhere nearby Bell Tower at the downtown area is well known. I believe we will fully appreciate the experience during your stay in Xi’an.

Finally, I wish everyone work well, study hard, enjoy the food, and have unforgettable experience in Xi’an!

China needs PROMS and May PROMS2016 Xi’an, China a greater success! Thank you!
## Contents

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary Report on the Development and Calibration of a Rasch</td>
<td>1</td>
</tr>
<tr>
<td>Scale to Measure Chinese Reading Comprehension Ability in</td>
<td></td>
</tr>
<tr>
<td>Singaporean 2nd Language Primary School Students</td>
<td></td>
</tr>
<tr>
<td>T. Chung, M. Z. Mohd Nor, R. J. J. Yan and J. P. L. Loo</td>
<td></td>
</tr>
<tr>
<td>Rasch Analysis Properties of a Chemistry Test for Form Four Students</td>
<td>15</td>
</tr>
<tr>
<td>Adeline Leong Suk Yee, Lay Yoon Fah and Mei-Teng Ling</td>
<td></td>
</tr>
<tr>
<td>Batik Artisans’ Judgment of Batik Wax Quality and Its Criteria:</td>
<td>27</td>
</tr>
<tr>
<td>An Application of the Many-Facets Rasch Model</td>
<td></td>
</tr>
<tr>
<td>Komarudin Kudiya, Bambang Sumintono, Setiawan Sabana and Agus Sachari</td>
<td></td>
</tr>
<tr>
<td>Exporting to China: The Future of a Genuine Collaboration with the West</td>
<td>39</td>
</tr>
<tr>
<td>Trevor G. Bond and Zi Yan</td>
<td></td>
</tr>
<tr>
<td>Research Design Considerations in Human Science Research:</td>
<td>49</td>
</tr>
<tr>
<td>Reconciling Conceptions of Science, Theories of Measurement and</td>
<td></td>
</tr>
<tr>
<td>Research Methods</td>
<td></td>
</tr>
<tr>
<td>Robert F. Cavanagh and William P. Fisher Jr.</td>
<td></td>
</tr>
<tr>
<td>Test Equating with Winsteps and GITEST: Different but Alike</td>
<td>67</td>
</tr>
<tr>
<td>Wu Jinyu and Quan Zhang</td>
<td></td>
</tr>
<tr>
<td>Evaluating an Evaluation Program: Unknowable Outcomes</td>
<td>87</td>
</tr>
<tr>
<td>Jeffrey Durand</td>
<td></td>
</tr>
<tr>
<td>Measuring Student Competency in University Introductory Computer</td>
<td>97</td>
</tr>
<tr>
<td>Programming: Epistemological and Methodological Foundations</td>
<td></td>
</tr>
<tr>
<td>Leela Waheed and Robert F. Cavanagh</td>
<td></td>
</tr>
</tbody>
</table>
Main Psychometric Factors of Video Game Gratification Among Taiwan Adolescents: A Pilot Study .......................... 117
Pei-Jung Hsieh

A Pilot Study of Student Teachers’ Infinity Thinking Assessment: Part I—Rasch Analysis .................................................. 125
Lee Fong Ng, Vincent Pang and Kin Eng Chin

Rasch Analysis of Attitude and Motivation Towards Language Choice and Use of the Sabah Malay Dialect Instrument (AMCUSM) for Chinese Students in Sabah, Malaysia ........................................ 141
Shaw Mei Cheong, Mei-Teng Ling, Jane Wong Kon Ling and Saidatul Nornis Haji Mahali

Re-analysis of Scientific Creativity Test for Pre-schoolers Using Rasch Model .............................................................. 153
Mui Ken Chin, Mei-Teng Ling and Nyet Moi Siew

Evaluating the Sentence Form Test as a Test of English Writing for Students in Three Japanese Universities ......................... 167
Kristy King Takagi and YihYeh Pan

Junxia Chai

Students’ Moral Behaviour Inventory Development and Validation: A Rasch Analysis .......................................................... 189
Sainah Limbasan, Mei-Teng Ling and Vincent Pang

Research on the Effectiveness of Individualized Feedback on Voting Behavior ................................................................. 199
Chang Liu and Jianghong Han

Measuring Change in Early Mathematics Ability of Children Who Learn Using Games: Stacked Analysis in Rasch Measurement . . . . . 215
Mei-Teng Ling, Vincent Pang and Connie Cassy Ompok

Using Rasch Analysis to Examine the Effects of Year 5 Students’ Understanding of Whole Numbers Multiplication .................. 227
Chin Pheng Chai, Vincent Pang and Kin Eng Chin