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RMT

RASCH MEASUREMENT

Transactions of the Rasch Measurement SIG
American Educational Research Association

Overview of The Issue

In this issue of RMT, we have included two research notes and several announcements that may be of interest to the Rasch community.

First, the issue includes a research note from Dr. Michael Linacre related to Conditional Maximum Likelihood Estimation.

In the second research note, we present the first installment of the "Ask an Expert" series that we discussed in the RMT Survey (see our last issue). Dr. Andrew Maul provided the first response in this series.

Following the research notes are announcements related to two upcoming conferences, which have had format changes related to concerns about Covid-19. First, we present an announcement related to the International Objective Measurement Workshop (IOMW) by the workshop organizers. Then, we present several announcements related to the Research Association (AERA), including an announcement of the winner of the Benjamin D. Wright Senior Scholar Award from the Rasch Measurement Special Interest Group (Rasch SIG), and a list of Rasch-related sessions.

The issue rounds out with a few other informational announcements, including upcoming Rasch courses or workshops and a list of recent publications in *Journal of Applied Measurement.*

Sincerely,

Your RMT Co-editors, Leigh and Stefanie

Rasch Measurement Transactions
www.rasch.org/rmt

CMLE – a Problem, its Solution and a Useful Approximation

CMLE, Conditional Maximum Likelihood Estimation, produces statistically consistent item estimates for Rasch data, so that, as the person sample size increases, the CMLE item estimates converge to their true values. However there is a problem. The person theta estimates are not congruent with the item estimates. This is because CMLE, as usually implemented, only produces item estimates. These item estimates are then used as anchor values in AMLE, Anchored Maximum Likelihood Estimation, to produce theta estimates. The solution is to use CMLE for both the persons and the items. Both of these CMLE estimates can be approximated from JMLE results. Here are the details.

John Michael Linacre

<table>
<tr><td>1.</td><td>Concept</td><td>Details</td></tr>
<tr><td>2.</td><td>Situation 1:</td><td>The dichotomous data are symmetric</td></tr>
<tr><td>3.</td><td>Dataset 1:
4 items, E1, E2, E3, E4
4 persons, P1, P2, P3, P4</td><td>
<table>
<tr><td></td><td>E1</td><td>E2</td><td>E3</td><td>E4</td><td>Total</td></tr>
<tr><td>P1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>P2</td><td>0</td><td>1</td><td>1</td><td>0</td><td>2</td></tr>
<tr><td>P3</td><td>0</td><td>1</td><td>1</td><td>1</td><td>3</td></tr>
<tr><td>P4</td><td>0</td><td>0</td><td>1</td><td>1</td><td>2</td></tr>
<tr><td>Total</td><td>1</td><td>2</td><td>3</td><td>2</td><td></td></tr>
</table>
</td></tr>
<tr><td>4.</td><td>CMLE item estimates produced by R Statistics package, eRm</td><td>CMLE Item Easiness
E1 = -0.955, E2 = 0.000, E3 = 0.955, E4 = 0.000
Item Difficulty = - Item Easiness</td></tr>
<tr><td>5.</td><td>Internally in eRm</td><td>Anchor the item estimates at their CMLE values, then</td></tr>
<tr><td>6.</td><td>AMLE person estimates produced by eRm</td><td>AMLE Ability Theta
P1 = -1.209, P2 = 0.000, P3 = 1.209, P4 = 0.000</td></tr>
<tr><td>7.</td><td>Logit ranges</td><td>CMLE Item range: 1.910
AMLE Person range: 2.418
Different!</td></tr>
<tr><td>8.</td><td>Problem: Biased person estimates</td><td>The data are symmetric
The item and person estimates are not symmetric
If CMLE estimates are unbiased, then AMLE estimates must be biased</td></tr>
<tr><td>9.</td><td>Solution</td><td>CMLE of items
Transpose the data matrix
CMLE of persons</td></tr>
<tr><td>10.</td><td>CMLE person estimates produced by eRm</td><td>CMLE Ability Theta
P1 = -0.955, P2 = 0.000, P3 = 0.955, P4 = 0.000</td></tr>
</table>

<table>
<tr><td>11.</td><td>Logit ranges</td><td>CMLE Item range: 1.910
CMLE Person range: 1.910
The same!</td></tr>
<tr><td>12.</td><td>Solution 1:</td><td>1. AMLE of person estimates is biased
2. CMLE person estimation solves this problem</td></tr>
<tr><td>13.</td><td>Situation 2:</td><td>An asymmetric dichotomous dataset</td></tr>
<tr><td>14.</td><td>Dataset 2:
4 items, E1, E2, E3, E4
5 persons, P1, P2, P3, P4, P5</td><td><table>
<tr><th></th><th>E1</th><th>E2</th><th>E3</th><th>E4</th><th>Total</th></tr>
<tr><td>P1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>P2</td><td>0</td><td>1</td><td>0</td><td>1</td><td>2</td></tr>
<tr><td>P3</td><td>0</td><td>0</td><td>1</td><td>1</td><td>2</td></tr>
<tr><td>P4</td><td>0</td><td>1</td><td>1</td><td>1</td><td>3</td></tr>
<tr><td>P5</td><td>0</td><td>1</td><td>1</td><td>1</td><td>3</td></tr>
<tr><td>Total</td><td>1</td><td>3</td><td>3</td><td>4</td><td></td></tr>
</table></td></tr>
<tr><td>15.</td><td>CMLE item estimates produced by eRm</td><td>CMLE Item Easiness
E1 = -1.385, E2 = 0.160, E3 = 0.160, E4 = 1.065</td></tr>
<tr><td>16.</td><td>Since AMLE is biased, here are CMLE person estimates produced by eRm</td><td>CMLE Ability Theta (transposed matrix)
P1 = -1.307, P2 = -0.284, P3 = -0.284, P4 = 0.937, P5 = 0.937</td></tr>
<tr><td>17.</td><td>Aligning CMLE person and item estimates</td><td>The means of both the item and person estimates are set to 0.0, so the person estimates need adjusting for overall performance of persons relative to items. We use the probability matrices to do this.</td></tr>
<tr><td>18.</td><td>Item CMLE: Here is the matrix of expected probabilities at the end of item estimation, before person estimation. This matrix is almost symmetric. (Not produced by eRm at time of writing.)</td><td><table>
<tr><th></th><th>E1</th><th>E2</th><th>E3</th><th>E4</th><th>Total</th></tr>
<tr><td>P1</td><td>0.046</td><td>0.213</td><td>0.213</td><td>0.528</td><td>1.000</td></tr>
<tr><td>P2</td><td>0.138</td><td>0.534</td><td>0.534</td><td>0.793</td><td>2.000</td></tr>
<tr><td>P3</td><td>0.138</td><td>0.534</td><td>0.534</td><td>0.793</td><td>2.000</td></tr>
<tr><td>P4</td><td>0.339</td><td>0.859</td><td>0.859</td><td>0.943</td><td>3.000</td></tr>
<tr><td>P5</td><td>0.339</td><td>0.859</td><td>0.859</td><td>0.943</td><td>3.000</td></tr>
<tr><td>Total</td><td>1.000</td><td>3.000</td><td>3.000</td><td>4.000</td><td></td></tr>
</table></td></tr>
<tr><td>19.</td><td>Person CMLE: Here is the matrix of expected probabilities at the end of person estimation. This matrix is almost symmetric, but is not the same as the item probabilities matrix</td><td><table>
<tr><th></th><th>E1</th><th>E2</th><th>E3</th><th>E4</th><th>Total</th></tr>
<tr><td>P1</td><td>0.039</td><td>0.239</td><td>0.239</td><td>0.482</td><td>1.000</td></tr>
<tr><td>P2</td><td>0.109</td><td>0.538</td><td>0.538</td><td>0.814</td><td>2.000</td></tr>
<tr><td>P3</td><td>0.109</td><td>0.538</td><td>0.538</td><td>0.814</td><td>2.000</td></tr>
<tr><td>P4</td><td>0.371</td><td>0.842</td><td>0.842</td><td>0.945</td><td>3.000</td></tr>
<tr><td>P5</td><td>0.371</td><td>0.842</td><td>0.842</td><td>0.945</td><td>3.000</td></tr>
<tr><td>Total</td><td>1.000</td><td>3.000</td><td>3.000</td><td>4.000</td><td></td></tr>
</table></td></tr>
</table>

<table>
<tr><td>20.</td><td>Solution 2: Alignment procedure for CMLE person and item estimates using the probability matrices.</td><td>The means of both the CMLE item and CMLE person estimates are set to 0.0, so the person distribution needs aligning to the item distribution.
Step 1) Look for a cell with probability X near 0.5.
Comparing these two probability matrices, we see that for P1/E4 the values bracket .50, so let’s average them: X = (0.528+0.482)/2 = 0.505
Step 2) Identify the CMLE item easiness and CMLE person ability estimates for the cell. Example: E4 = 1.065, P1 = -1.307
Step 3) Add to the CMLE person estimates:
Adjustment = ln(X/(1-X)) - CMLE Item Easiness - CMLE Person Ability
Example: = ln(0.505 / 0.495) - 1.065 - -1.307 = 0.262 logit adjustment
Aligned CMLE Ability Theta
P1 = -1.045, P2 = -0.022, P3 = -0.022, P4 = 1.199, P5 = 1.199</td></tr>
<tr><td>21.</td><td>A useful approximation</td><td>CMLE estimates from CMLE or JMLE probabilities</td></tr>
<tr><td>22.</td><td>JMLE: Here is the matrix of expected probabilities for Dataset 2 at the end of item and person estimation. This matrix is symmetric.</td><td><table>
<tr><td></td><td>E1</td><td>E2</td><td>E3</td><td>E4</td><td>Total</td></tr>
<tr><td>P1</td><td>0.032</td><td>0.232</td><td>0.232</td><td>0.505</td><td>1.000</td></tr>
<tr><td>P2</td><td>0.115</td><td>0.542</td><td>0.542</td><td>0.800</td><td>2.000</td></tr>
<tr><td>P3</td><td>0.115</td><td>0.542</td><td>0.542</td><td>0.800</td><td>2.000</td></tr>
<tr><td>P4</td><td>0.369</td><td>0.842</td><td>0.842</td><td>0.947</td><td>3.000</td></tr>
<tr><td>P5</td><td>0.369</td><td>0.842</td><td>0.842</td><td>0.947</td><td>3.000</td></tr>
<tr><td>Total</td><td>1.000</td><td>3.000</td><td>3.000</td><td>4.000</td><td></td></tr>
</table></td></tr>
<tr><td>23.</td><td>Coincidences between cell probabilities: CMLE items, CMLE persons, JMLE</td><td>1) Marginal item (column) and person (row) totals are the same for all three probability matrices. Though JMLE estimates are more dispersed than CMLE estimates, their totals are the same.
2) Probabilities in the cells of all three matrices are functionally the same. Conclusions based on cell probabilities, such as standard errors and mean-square fit statistics, are effectively the same for JMLE and CMLE.
JMLE cell probabilities approximate CMLE cell probabilities.</td></tr>
<tr><td>24.</td><td>The CMLE theory</td><td>For a person score of 1, for any pair of items, here items 1 and 2,
Exp(E1) / Exp(E2) = Probability (E1)/Probability(E2)
Example using CMLE item probabilities, person P1, score 1,
Exp(E1) / Exp(E2) = Exp(-1.385)/Exp(0.160) = 0.213
Probability (E1)/Probability(E2) =0.046/0.213 = 0.216
These values are effectively equal. CMLE theory confirmed.</td></tr>
<tr><td>25.</td><td>Approximate CMLE estimates from CMLE/JMLE probabilities</td><td>Since all the probability matrices are similar, approximate CMLE item or CMLE person estimates can be obtained from CMLE item or CMLE person or JMLE cell probabilities for a person or item with a score of 1.</td></tr>
</table>

26.	Approximate CMLE item estimates from the CMLE person or JMLE probability matrices	Step 1) Using a CMLE person or JMLE probability matrix, identify or generate a person with a score of 1. Example: P1 Step 2) Compute the probabilities (expected values) for every item. Example from the JMLE matrix: 0.039 0.232 0.232 0.505 Step 3) Identify a probability, Pmiddle, in the middle of the range. Assign its item an estimate of 0 logits with Exp (0) = 1. Example: Pmiddle = 0.232, E2 = 0.000 logits Step 4) The CMLE estimates for all the other items are: Target Item estimate = ln (target item probability / Pmiddle) Example: E1, E2, E3, E4 = -1.783, 0.000, 0.000, 0.778 Step 5) Subtract the mean of all the item estimates from each of the item estimates. These are now the approximate CMLE item estimates. Example: mean = -0.251 E1 = -1.532, E2 = 0.251, E3 = 0.251, E4 = 1.029
27.	Three sets of "CMLE" item estimates:	Exact: CMLE Item Easiness directly or from CMLE item probabilities E1 = -1.385, E2 = 0.160, E3 = 0.160, E4 = 1.065 Approximate: CMLE Item Easiness from CMLE person probabilities E1 = -1.535, E2 = 0.278, E3 = 0.278, E4 = 0.979 Approximate: CMLE Item Easiness from JMLE probabilities E1 = -1.532, E2 = 0.251, E3 = 0.251, E4 = 1.029 Note: in this example, item estimates from JMLE probabilities are closer to exact item CMLE than item estimates from CMLE person probabilities.
28.	Approximate CMLE person estimates	Same estimation procedure as above using the CMLE item or JMLE probabilities for an item with a score of 1.
29.	Three sets of "CMLE" person estimates (unaligned):	Exact: CMLE Ability Theta directly or from CMLE person probabilities P1 = -1.307, P2 = -0.284, P3 = -0.284, P4 = 0.937, P5 = 0.937 Approximate: CMLE Ability Theta from CMLE item probabilities P1 = -1.238, P2 = -0.140, P3 = -0.140, P4 = 0.759, P5 = 0.759 Approximate: CMLE Ability Theta from JMLE probabilities P1 = -1.331, P2 = -0.250, P3 = -0.250, P4 = 0.916, P5 = 0.916 Note: in this example, person estimates from JMLE probabilities are closer to exact person CMLE than person estimates from CMLE item probabilities.
30.	Aligning CMLE person and CMLE item estimates (exact or approximate)	Same alignment procedure as above. Notice that for P1/E4 the JMLE probability is 0.505, the average value we obtained above.

31.	Advantages of using the JMLE probability matrix to obtain approximate CMLE estimates	1) JMLE computation is faster for large matrices 2) JMLE easily accommodates missing data 3) JMLE probability matrix and JMLE-based CMLE estimates are symmetric for symmetric data 5) Using zero-weighted dummy items and persons, JMLE generates probability matrices which include all possible person and item scores for CMLE-compatible item and person score-to-measure tables.

Ask an Expert: Rasch and Dimensionality

Beginning with this issue, we will periodically include "Ask an Expert" columns in which measurement scholars submit a question to be answered by one or more experienced Rasch scholars.

In this first column, the topic is related to dimensionality and Rasch measurement. Dr. Andrew Maul responded to the following question:

"***What do you consider an appropriate approach to evaluate the Rasch assumption of unidimensionality*?"**

Response by Andrew Maul

I think any user of Rasch models would do well to be aware of a range of statistical approaches for evaluating dimensionality, perhaps starting both with the more confirmatory model-comparison approach favored in the MRCML framework (described by, e.g., Briggs & Wilson, 2003) and the more exploratory PCA-of-residuals approach (described by, e.g., Bond & Fox, 2015, ch.12). That said, I would be suspicious of any one-size-fits-all response to this question, as examinations of the fit of data to models (whether framed as investigations of dimensionality, item and person fit, DIF, etc.) are useful only to the extent to which the models correspond to well-articulated theories about real-world states of affairs, and thus the very phrase "the Rasch assumption of unidimensionality" could be viewed as potentially misleading: after all, models don't make assumptions, *human beings* make assumptions when we use models for particular purposes, and the same model can be put to work in very different ways.

We might consider two short examples. In the first, a research team is interested in measuring a psychological property hypothesized to be quantitative in the strong sense given by, e.g., Joel Michell (1999): here tests of model fit and dimensionality could be viewed as providing circumstantial (though not definitive) evidence regarding a number of relevant hypotheses (e.g., that the measured property is indeed quantitative and has been successfully measured by a given test; see, e.g., Borsboom & Mellenbergh, 2004). In a second example, a research team interested in maximizing the pedagogical utility of a test targeting an assemblage of skills in a specified domain; here, the target properties might be regarded as reflecting regularities in co-occurrences of conceptual and linguistic resources (a la Mislevy, 2018) rather than independently-existing quantities, and the most pressing task for the researcher might not be to demonstrate that the properties are empirically distinguishable *prior* to instruction, but that they are independently sensitive to instruction, which requires a carefully-designed experimental strategy in addition to appropriate tests of (post-intervention) dimensionality.

Statistical models can be powerful tools, but they cannot in themselves supply or replace substantive theory, nor can they tell us what our goals or values should be in any given setting. For that, as ever, there is no substitute for situated, theory-informed, value-conscious human reasoning.

References

Borsboom, D., & Mellenbergh, G. (2004). Why psychometrics is not pathological: A comment on Michell. *Theory and Psychology, 14,* 105-120.

Bond, T., & Fox, C. M. (2015). *Applying the Rasch model: Fundamental measurement in the human sciences (third edition).* New York and London: Routledge.

Briggs, D. C., & Wilson, M. (2003). An introduction to multidimensional measurement using Rasch models. *Journal of Applied Measurement*, *4*(1), 87-100.

Michell, J. (1999). *Measurement in psychology: A critical history of a methodological concept.* Cambridge University Press Cambridge, England.

Mislevy, R. J. (2018). *Sociocognitive foundations of educational measurement*. Routledge.

Spring 2020 Conference News

Announcement: IOMW 2020 Conference

Following the decisions by AERA and NCME to cancel their in-person meetings due to the global spread of the coronavirus disease (COVID-19), we are also cancelling the plans for the IOMW 2020 face-to-face meeting in Berkeley in April.

However, we greatly appreciate the value of having us meet and share our work, our views and our common values. Hence, we are investigating alternative ways to keep our community connected and up to date with the work we are all doing during 2020. If you are interested in providing us with your input and suggestions, please take a short survey (URL: shorturl.at/kBIJ7) by Wednesday, March 18.

We would like to use this opportunity to thank those of you who have been planning to attend, those who proposed contributions to the conference, and especially those who have been helping with organization, reviewing, and mentoring planning for IOMW 2020.

This is disappointing news to share—however, the health, safety, and well-being of our colleagues is our top priority.

In closing, we attach the abstracts of keynote speeches we planned for IOMW 2020. It is our hope to deliver these along with accepted presentations in alternative formats within this year.

Warmest regards and be well,

IOMW 2020 Organizing Committee

Rethinking the Meaning of Measurement
Luca Mari (Università Cattaneo, Italy)

What is the fundamental information conveyed by a measurement relation such as

length(my pen) = 0.123 m

reporting a simple measurement result (assuming no uncertainty is involved)? Does it mean that the value 0.123 m represents the measurand length(my pen), and therefore that measurement is a way of representation, as advocated in particular by representational theories of measurement?

Or does it mean that the value is an expression of the measurand, and therefore that measurement is a way of expression, as Maxwell described the meaning of the formula $Q = \{Q\}\cdot[Q]$ about which he wrote that the quantity Q is expressed by the numerical value {Q} multiplying the unit [Q]?

I hold that these are partial perspectives about measurement, whose epistemic role is better understood by a bolder, and more traditional, claim: that relation is what is written to be, i.e., an equation. An analysis is offered of this interpretation, and some of its philosophical and operative consequences are proposed to the discussion.

Measurement Issues Associated with Learning Map Assessments
Neal Kingston (University of Kansas)

Most assessments are modeled on a unidimensional or a multi-dimensional scales with relatively few dimensions. The Dynamic Learning Maps Alternate Assessment is based on a diagnostic classification model wherein student mastery of hundreds of distinct nodes are estimated or inferred. This paradigm is grounded in a set of philosophical principles that have some communality with the extended Rasch family of models and some significant differences and is beset by numerous estimation challenges. This talk will address both, summarizing the past several years of research.

Benjamin Drake Wright Senior Scholar Award Winner

Dr. Carol M. Myford, Emerita Professor at the University of Illinois, Chicago Campus, is the winner of the Benjamin Drake Wright Senior Scholar Award for 2020. The award recognizes individuals for outstanding programmatic research and mentoring in Rasch measurement. Nominations for the award are solicited every other year.

Dr. Myford's program of research focuses on scoring issues in performance and portfolio assessments. She has conducted studies related to training raters, designing scoring rubrics, quality control monitoring, improving rater performance, detecting and measuring different types of rater effects, and understanding cognitive processes that underlie unusual or discrepant rating patterns. Dr. Myford has devised rating scales and rubrics to evaluate complex performances and products and has analyzed sets of rating data from a variety of fields using many-facet Rasch measurement models. Dr. Myford's work blends qualitative and quantitative approaches to examining rating processes, illustrating how the interplay of statistical and qualitative analyses can help one develop, monitor, and continually improve large-scale performance and product assessment systems.

Dr. Myford earned her PhD in the Measurement, Evaluation, and Statistical Analysis program at the University of

Chicago in 1989. From 1990 through 2002, Dr. Myford worked at ETS, rising from Associate Research Scientist to Senior Research Scientist and winning the ETS Scientist Award in 1995. From 2002 to 2015, Dr. Myford was Associate Professor of Educational Psychology in the College of Education, University of Illinois at Chicago, where she received a teaching recognition award in 2006 and twice received a Fulbright Specialist Award. Dr. Myford has held assessment- and measurement-related positions in government, business and industry, and higher education. Currently in "semi-retirement," she provides assessment- and measurement-related training and consultation in the U.S. and abroad.

As winner of the Senior Scholar Award, Dr. Myford will be delivering the keynote address at the Rasch SIG Business meeting this Spring in San Francisco.

Congratulations to Dr. Myford!

E. Matthew Schulz

List of Accepted AERA Conference Presentations related to Rasch Measurement Theory

***Note: At the time of this publication, exact details regarding the format/timing of "virtual" presentations via Zoom or recordings had not been announced. However, AERA did state the conference would take place starting on April 17, 2020, as originally planned. The accepted presentations are listed with their original dates/time.**

Rasch Measurement SIG *Business Meeting*
- *Time:* Sun, April 19, 6:30 to 8:30pm
- *Speaker:* Dr. Carol Myford

Paper Sessions:

- **Educational Measurement, Psychometrics, and Assessment**
  - Advancements in Detecting Differential Item Functioning and Measurement Invariance
    - *Time:* Fri, April 17, 2:15 - 3:45 pm
    - *Paper:* The effect of Covariant Variable on Determination of Differential Item Functioning Using Mixture Rasch Model – *Gozde Sirganci, Bozok University; ömay çokluk bökeoğlu*
  - Innovative Approaches to Item Response Theory
    - *Time:* Tue, April 21, 2:15 - 3:45 pm
    - *Paper:* Polytomous Item Explanatory Item Response Theory Models with Random Item Errors: Simulation and Empirical Studies – *Jinho Kim, KU Leuven, & Mark R. Wilson, University of California – Berkeley*
- Methodological Approaches in Rasch Measurement
  - *Time:* Sun, April 19, 12:25 - 1:55pm

  Papers:
  - Decision Consistency and Accuracy of Household Food Insecurity Classifications Using a Partial Credit Model – *Victoria Tanaka, University of Georgia -Athens; George Engelhard, University of Georgia; Matthew Rabbitt, The United States Department of Agriculture Economic Research Service*
  - Developing Rasch/Guttman-Based Scenario (RGS) Scales to Enhance Scale Score Interpretation: A Methodological Framework – *Larry H. Ludlow, Katherine Ann Reynolds, & Maria Eugenia Baez*

Cruz, Boston College; Wen-Chia Claire Chang, National Institute of Education -Nanyang Technological University
- Evaluating the Impact of Multidimensionality on Type I and Type II Error Rates Using the Q-Index Item Fit Statistic for the Rasch Model – *Samantha Estrada, University of Texas at Tyler*
- Exploring the Impact of Missing Data on Principal Component Analysis of Residuals – *Stefanie A. Wind & Randall E. Schumacker, The University of Alabama - Tuscaloosa*

Other Rasch-Related Papers in Sessions:

- Roundtable session: New Methods for Evaluating School Climate, Student Well-Being, and Social-Emotional Learning
    - Time: Friday, April 17, 4:05pm – 6:05pm
    - ***Paper:*** Measuring California Superintendents' Beliefs About School Climate Assessment: New Insights From Item Response Theory Analysis – *Yidan Zhang, University of California, Berkeley, Anji Buckner, San Jose State University, Brent Duckor, San Jose State University, and Mark Wilson, University of California, Berkeley*
- Symposium on Assessing Complex Constructs: Examining Construct and Consequential Validity and Implications for Realizing Educational Equity
    - *Time:* Tue, April 21, 10:35am - 12:05pm
    - ***Paper*:** Linking Negative Consequences of Use of edTPA to Construct Validity Issues - *Nadia Behizadeh, Georgia State University*

- Symposium on Communicating Psychometric Information to Diverse Audiences: From Early Childhood Teachers to Policy Makers
    - *Time:* Tue, April 21, 8:15 - 10:15am
    - ***Paper*:** Examining the Early Language and Literacy Trajectories of Dual Language Learners - *Joshua Sussman, University of California - Berkeley*

- Early Childhood Assessments
    - *Time:* Mon, April 20, 10:35am - 12:05 pm
    - *Paper:*Identifying Differential Item Functioning of an Early Math Scale - *Qiao Lin & Kathleen Sheridan, University of Illinois at Chicago*

- Educational Technology/Computational Thinking
    - *Time:* Sun, April 19, 2:15 - 4:15 pm
    - *Paper:* Validity Evidence for the "Computational Thinking Test" at the Upper Secondary Level Using Item Response Theory and Confirmatory Factor Analysis - *Josef Guggemos, & Sabine Seufert, University of St. Gallen; Marcos Román González, Universidad Nacional de Educación a Distancia*

- Evaluating, Optimizing, and Monitoring Rater Performance
    - *Time:* Mon, April 20, 8:15 - 9:45 am
    - ***Papers****:*
        - An Approach to Investigating Construct-Irrelevant Variance for Contextualized Constructed-Response Assessment – *Xiaoming Zhai, Michigan State University; Kevin Haudek, Michigan State University; Molly A.M. Stuhlsatz, BSCS Science Learning; Christopher D. Wilson, Biological Sciences Curriculum Study*
        - The Diagnostic Rating System: Rater Behavior for an Alternative Performance Assessment Rating Method - *Allison Ames Boykin, University of Arkansas; Nnamdi Chika Ezike, University of Arkansas at Fayetteville*

- Symposium on Igniting Discussions About Measures for K-12 Mathematics Education Contexts
  - *Time:* Fri, April 17, 2:15 - 3:45pm
  - *Paper*: Developing a Series of Problem-Solving Measures for Elementary Students - *Jonathan David Bostic, & Gabriel Matney, Bowling Green State University; Toni A. Sondergeld, Drexel University; Gregory E. Stone, University of Toledo*

- Symposium on Learning Trajectories as Boundary Objects for Psychometricians, Learning Scientists, and Practitioners in Mathematics Education
  - *Time:* **Mon, April 20, 12:25 - 1:55pm**
  - *Paper*: Developing Research-Based Learning Trajectories to Support Mathematical Reasoning in the Middle Years: An Australian Perspective - *Dianne E. Siemon, Royal Melbourne Institute of Technology; Lorraine F Day, University of Notre Dame Australia; Marj H. Horne, The Australian Catholic University; Rosemary Callingham, University of Tasmania*

- Local to Global: Influence and Impact of Educational Research in the Public Interest
  - *Time:* Sat, April 18, 4:05 to 5:35pm
  - *Paper*: Fitting the World? World Values Survey, Global Citizenship, and Item-Response Theory - *Michael Thier, International Baccalaureate; Lorna Porter, University of Oregon; Paul T Beach, Inflexion*

- Symposium on Professional Ethics for Future Teachers: Toward a Common Vision
  - *Time:* Sun, April 19, 2:15 - 4:15pm
  - *Paper*: Adaptation, Piloting, and Validation of a Test of Ethical Sensitivity in Teaching - *Bruce Maxwell, Université du Québec à Trois-Rivières; Nicolas Jordan Tanchuk, Iowa State University; Helen Joanna Boon, James Cook University - Australia*

- Symposium on Preservice Courses, Student Teaching Experiences, and Beginning Teacher Outcomes
  - *Time:* **Tue, April 21, 12:25 - 1:55pm**
  - *Paper***:** Features of Teacher Preparation Related to Three Different Perspectives on Graduates' Instructional Readiness - *Kavita Kapadia Matsko, Northwestern University; Matthew Ronfeldt, University of Michigan*

- Program Evaluation Methods: Implementation and Impact Measurements
  - *Time:* Mon, April 20, 10:35am - 12:05 pm
  - *Paper:* Using Rasch Measurement Theory for Program Evaluation - *Albert Anthony Clairmont, Mike Wilton, & Daniel Katz, University of California - Santa Barbara*

- Symposium on The Relationship Between Distributed Leadership and Student Learning
  - *Time:* Mon, April 20, 2:15 - 3:45pm
  - *Paper*: Distributing Leadership for Collective Teacher Learning to Effect Student Learning Outcomes: A Singapore Case - *Salleh Hairon & Jonathan Goh, National Institute of Education, Nanyang Technological University*

- Who Benefits from Assessment in Higher Education?
  - *Time:* Sun, April 19, 12:25 - 1:55pm
  - *Paper*: Using student performance-based assessment for academic program improvement - *Jere Turner, Manchester Community College; Hui-Ling Chen, Massachusetts College of Art and Design*

Poster Sessions:

- Applications of the Rasch Measurement Model
    - *Time:* Mon, April 20, 10:35am - 12:05pm
  - *Posters:*
    - A Comparison of Two Differential Item Functioning Methods for Analyzing Rasch Model data: A monte Carlo Investigation – *Ning Jiang, University of South Carolina – Columbia; Kelvin Terrell Pompey, Yin Burgess, University of South Carolina; Tiejun Zhang, University of South Carolina – Columbia*
    - A Rasch Analysis of the Whatapp Usage Scale in a Turkish University Student Sample – *Ilker Soyturk, Riza Memis, Jason D. Schenker, Kent State University*
    - Comparing Teaching Practices in Mathematics Classrooms Across Cultures: Examples from the United Kingdom and Macau – *Ka Hei Lei, & Maria Pampaka, University of Manchester*
    - Examining the Math Anxiety Scale (MAS) in Turkish Middle School Students Using Rasch Analysis – *Ilker Soyturk, Kent State University; Busra Basak Ozyurt Soyturk, Marmara University*
    - Monotonicity as a Nonparametric Approach to Evaluating Rater Fit in Performance Assessments – *Stefanie A. Wind, The University of Alabama – Tuscaloosa*
    - The BC-LAMP Portfolio Project: Measuring Living a Life of Meaning and Purpose – *Larry H. Ludlow, Ella Anghel, Olivia Szendey, Theresa O'Keefe, Burton Howell, Christina Matz-Costa, Henry I. Braun, Boston College*
    - Validation of the Scientific Imagination Test-Verbal: A Learning Progression Approach - *Chia-Chi Wang, Southern Taiwan University of Science and Technology; Hsiao-Chi Ho, Providence University*

- Division D Section 1 Poster Session 1
    - *Time:* **Tue, April 21, 10:35am to 12:05pm**
  - *Posters:*
    - Assessing Partial Knowledge in the Rasch Model with Fixed Random Guessing Parameter: A Modified 1PL-AG Model – *Jiaqi Zhang, University of Cincinnati; Paul De Boeck, The Ohio State University; Jorge González, Pontificia Universidad Católica de Chile*
    - Rasch-based Measurement Development: A Formative Evaluation Instrument for College Teaching – *Ren Liu, & Xiufeng Liu, University at Buffalo – SUNY*

- Division D Section 1 Poster Session 2
    - *Time:* Sun, April 19, 8:15 - 9:45am
    - *Poster:* Optimizing Instruments for Students' Spatial Learning Attitudes and Interest in Science, Technology and Geospatial Technology - *Alec M Bodzin, Thomas C. Hammond, Qiong Fu, & William Farina, Lehigh University*

- Early Childhood Workforce Issues
    - *Time:* Sat, April 18, 4:05 - 5:35pm
    - *Poster:* Preschool Teachers' Use of Research-Based Literacy-Promoting Strategies: Implications for Training – *Katie Homant, Oakland University; Mingyang Liu, University of Toledo; Tomoko Wakabayashi, Melissa Bishop, & Adam LeRoy, Oakland University*

- Environmental Education SIG Poster Session
    - *Time:* Tue, April 21, 10:35am - 12:05pm
    - *Poster*: Working Toward an International Assessment of Ocean Literacy: Validating Instrument with Rasch Measurement Model – *Ying-*

Fang Chen, & Matthew A. Cannady, University of California – Berkeley; Géraldine Fauville, University of Gothenburg; & Craig Strang, University of California - Berkeley

- Issues in Contemporary Program Evaluation in Schools
  - *Time:* Mon, April 20, 2:15 - 3:45pm
  - *Poster:* A Simple and Instructive Approach to Examining Interrater Reliability - *Shannon O. Sampson, & Susan Cantrell, University of Kentucky*

- Preparing Culturally Responsive Teachers for Equity-Oriented Classrooms: How Do We Evaluate Their Effectiveness and Our Own? (Structured Poster Session)
  - *Time:* Sat, April 18, 10:35am - 12:05pm
  - *Poster:* Capturing the Complexity of Enacting Equity-Centered Teaching Practice: A Rasch-Based Scenario-Style Scale – *Wen-Chia Claire Chang, National Institute of Education – Nanyang Technological University; Larry H. Ludlow, Boston College; Lexie Barbara Grudnoff, The University of Auckland; Fiona Ruth Ell, & Mary F. Hill, University of Auckland; Marilyn Cochran-Smith, Boston College*

- Self-Directed Learning, Motivation, and Metacognition
  - *Time:* Sat, April 18, 10:35am - 12:05pm
  - *Poster:* Validating the Self-Efficacy for Self-Regulated Learning Scale for Use with College Students - *Ryan Iaconelli, Anna C Brady, & Christopher A. Wolters, The Ohio State University*

- Trends and Issues in Science Education
  - *Time:* Tue, April 21, 10:35am to 12:05pm
  - *Poster:* Exploring Global Science Teaching Practices from the PISA Perspective – *Hye Sun You, Arkansas Tech University; Hye Ryung Won, Florida State University*

- Validity and Assessing Survey Data in Educational Research
  - *Time:* Mon, April 20, 2:15 -3:45pm
  - *Poster:* A Measure of Statistical Anxiety Designed for Social Science Students - *Courtney Donovan, & Chen Zong, University of Colorado – Denver*

Roundtable Sessions:

- Applications of Item Response Theory
  - *Time:* Mon, April 20, 10:35am - 12:05pm
  - *Paper:*Evaluation of Flagging criteria for Anchor Item Stability Analysis – *Kata Nolan, Curriculum Associates; Nina Deng*

- Cooperative Learning Roundtable
  - *Time:* Sat, April 18, 8:15 - 9:45pm
  - *Paper:* Social Presence in Online Collaborative Learning: Definition and Measurement - *Karel Kreijns, Open Universiteit Nederland; Monique Bijker, Open Universiteit Nederland; Joshua Weidlich, Heidelberg University*

- Development, Validation, and Psychometric Testing of Assessments
  - *Time:* Fri, April 17, 12:00 -1:30pm
  - *Paper:* Exploration of the Psychometric Properties of Formative Assessment Items Developed by Teachers for Teachers - S*hannon O. Sampson, & Jie Dai, University of Kentucky; & Lori Hollen*

- Dialogue and Interactions for Science Learning
  - *Time:* Sat, April 18, 2:15 - 3:45pm
  - *Paper:*Teachers' Understanding about Dialogical Interaction as an Epistemic

Tool: Development of Questionnaire - *Gavin Fulmer, Jihyun Hwang, Chenchen Ding, Brian Hand, & William Hansen, The University of Iowa*

- International Computer and Information Literacy Study 2018: Situating U.S. Results Within an International Context
  - *Time:* Mon, April 20, 12:25 - 1:55pm
  - *Paper:* Measuring ICT: A Deeper Look at Computer and Information Literacy and Computational Thinking- *Julian M.S. Fraillon, Australian Council for Educational Research*

- Methodological Innovations in Researching Science Learning
  - *Time:* Sun, April 19, 2:15 - 3:45pm
  - *Paper:* Validation of an Instrument for Measuring High School Students' Interdisciplinary Understanding in Science Education - *Yu Lan, Zuhao Wang, & Shaohui Chi, East China Normal University*

- Psychometric Issues in Higher Education Assessment
  - *Time:* Sat, April 17, 12:25 - 1:55pm
  - ***Paper:*** Evaluating the Psychometric Properties of the Academic Capital Scale: A Rasch Modeling Application - *Christa Elisa Winkler, The Ohio State University*

- Research on the Teaching of English in Global Contexts
  - *Time:* Sat, April 18, 2:15 - 3:45pm
  - *Paper:*Validity and Reliability Evidences of a Self-Efficacy Scale for English Language Learners in Vietnam - *Do-Hong Kim, Augusta University; Chuang Wang, University of Macau*

- Teachers, Principals, and Librarians: Examining Roles in School Buildings
  - *Time**:*** Mon, April 20, 10:35am - 12:05pm
  - *Paper:* Examining the Preservice School Principals' Impromptus Speech Skills with a Many-Facet Rasch Model – *Ming Chuan Hsieh, National Academy for Educational Research; Akikito Kamata, Southern Methodist University*

- Vygotskian-Inspired Pedagogical Practice: Creating Transformative Spaces for Learning and Development
  - *Time:* Mon, April 20, 10:35am - 12:05pm
  - *Paper:*Rasch Modeling of Positive Intercultural Adaptation in Latinos at Two Universities - *Travis Henry, University of Georgia – Athens; Pedro R. Portes, University of Georgia; Diego Boada Beltran, University of Georgia – Athens; Ruben Atilano, University of Georgia - Athens*

Recent and Forthcoming Publications of Interest to the Rasch Community

Members of the Rasch community may be interested to learn about the following forthcoming and recent publications:

Coming Soon: Applying the Rasch Model, 4th Edition

The fourth edition of *Applying the Rasch Model* is in production with Routledge. The book is expected to be available in mid-2020. Watch for more details about this text in a future issue of Rasch Measurement Transactions!

A Scientometric Review of Rasch Measurement: The Rise and Progress of a Specialty

Rasch scholars may be interested to read a recent review article by Vahid Aryadoust, Hannah Ann Hui Tan, and Li Ying Ng. The article is available at the following link: https://doi.org/10.3389/fpsyg.2019.02197

Abstract:

A recent review of the literature concluded that Rasch measurement is an influential approach in psychometric modeling. Despite the major contributions of Rasch measurement to the growth of scientific research across various fields, there is currently no research on the trends and evolution of Rasch measurement research. The present study used co-citation techniques and a multiple perspectives approach to investigate 5,365 publications on Rasch measurement between 01 January 1972 and 03 May 2019 and their 108,339 unique references downloaded from the Web of Science (WoS). Several methods of network development involving visualization and text-mining were used to analyze these data: author co-citation analysis (ACA), document co-citation analysis (DCA), journal author co-citation analysis (JCA), and keyword analysis. In addition, to investigate the inter-domain trends that link the Rasch measurement specialty to other specialties, we used a dual-map overlay to investigate specialty-to-specialty connections. Influential authors, publications, journals, and keywords were identified. Multiple research frontiers or sub-specialties were detected and the major ones were reviewed, including "visual function questionnaires", "non-parametric item response theory", "valid measures (validity)", "latent class models", and "many-facet Rasch model". One of the outstanding patterns identified was the dominance and impact of publications written for general groups of practitioners and researchers. In personal communications, the authors of these publications stressed their mission as being "teachers" who aim to promote Rasch measurement as a conceptual model with real-world applications. Based on these findings, we propose that sociocultural and ethnographic factors have a huge capacity to influence fields of science and should be considered in future investigations of psychometrics and measurement. As the first scientometric review of the Rasch measurement specialty, this study will be of interest to researchers, graduate students, and professors seeking to identify research trends, topics, major publications, and influential scholars.

Novice Study of Teacher Learning Progressions in Posing, Pausing and Probing Practices: A Multi-Dimensional IRT Analysis

Rasch scholars may be interested in this recent study by Brent Duckor and Carrie Holmberg. The authors have posted an abstract, video clip, and presentation slides at the following web address:

https://bearcenter.berkeley.edu/seminar/novice-study-teacher-learning-progressions-posing-pausing-and-probing-practices-multi

Upcoming Rasch Measurement Courses and Workshops

July 2020: 10-Week Online Course on Rasch Measurement Theory with Geoff Masters

ACER will offer a 10-week master's level online course titled *Understanding Rasch*

Measurement Theory beginning in July 2020. Geoff Masters will be the instructor.

For more details, please see:

https://www.acer.org/au/professional-learning/postgraduate/rasch

List of Recent Publications in *Journal of Applied Measurement*

Vol. 20, No. 4, Winter 2019

Evaluating Angoff Method Structured Training Judgments by the Rasch Model -- *Ifeoma C. Iyioke*

An Examination of Sensitivity to Measurement Error in Rasch Residual-based Fit Statistics -- *R. Noah Padgett and Grant B. Morgan*

Identifying Bullied Youth: Re-engineering the Child-Adolescent Bullying Scale into a Brief Screen -- *Judith A. Vessey, Tania D. Strout, Rachel L. Difazio, and Larry H. Ludlow*

Priors in Bayesian Estimation under the Rasch Model -- *Seock-Ho Kim, Allan S. Cohen, Minho Kwak, and Juyeon Lee*

An IRT-Based Objection Against the IQ -- *Takuya Yanagida and Klaus D. Kubinger*

Evaluating Observer Ratings: The Case of Measuring Neighborhood Disorder -- *Mei Ling Ong, George Engelhard, Jr., Eric T. Klopack, and Ronald L. Simons*

Measuring Genuine Progress: An Example from the UN Millennium Development Goals -- *William P. Fisher, Jr.*

Using Rasch Analyses to Inform the Revision of a Scale Measuring Students' Process-Oriented Writing Competence in Portfolios -- *Mai Duong, Cuc Nguyen, and Patrick Griffin*

Vol. 21, No. 1, Spring 2020

Rasch's Logistic Model Applied to Growth -- *Mark H. Stone*

Psychometric Properties of the General Movement Optimality Score using Rasch Measurement -- *Vanessa Maziero Barbosa, Everet V. Smith, Arend Bos, Giovanni Cioni, Fabrizio Ferrari, Andrea Guzzetta, Peter B. Marschik, Jasmin Pansy, Berndt Urlesberger, Hong Yang, and Christa Einspieler*

Rasch Analysis of the Burn-Specific Pain Anxiety Scale: Evidence for the Abbreviated Version -- *E. E. de Jong, W. Tuinebreijer, H. W. C. Hofland, and N. E. E. Van Loey*

Trade-Offs in the Implementation of Observational Ratings Systems -- *Stephen M. Ponisciak, Rob Meyer, Anna Brown, and Tracy Schatzberg*

Alignment of a Language Instrument Scores to CEFR Levels: Methodological and Empirical Considerations -- *Georgios D. Sideridis, Abdulrahman Al-Samrani, and Bjorn Norrbom*

Validation of Egalitarian Education Questionnaire using Rasch Measurement Model -- *Nik Muhammad Hanis Nek Rakami, Nik Ahmad Hisham Ismail, Noor Lide Abu Kassim, and Faizah Idrus*

Bootstrap Estimate of Bias for Intraclass Correlation -- *Xiaofeng Steven Liu and Kelvin Terrell Pompey*

Measuring Genuine Progress: An Example from the UN Millennium Development Goals (Corrected version) -- *William P. Fisher, Jr.*