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RMT

RASCH MEASUREMENT TRANSACTIONS

Transactions of the Rasch Measurement SIG
American Educational Research Association

Overview of The Issue

In this issue of RMT, we have included one peer-reviewed research note, one speech, and several announcements that may be of interest to the Rasch community.

The issue begins with a research note from Yang Shao, Sanjay Nadkarni, Kailun Niu, and Tsair-Wei Chien on the Newton-Raphson Iteration Method in the Rasch Model.

Following the research note is Dr. Carol Myford's speech from the 2021 Rasch Measurement SIG business meeting.

Then, we provide an announcement that may be of interest to our readers regarding events offered by the non-profit organization Women in Measurement.

As always, we welcome your contributions to the next issue for RMT. We would appreciate receiving your research note, conference or workshop announcement, etc. by June 1, 2022. Please contact us at the email addresses below if you wish to submit something for inclusion.

Sincerely,
Your RMT Co-editors, Leigh and Stefanie

Rasch Measurement Transactions
www.rasch.org/rmt

A Note on the Newton-Raphson Iteration Method in the Rasch Model

The Newton-Raphson Iteration Method (NRIM), as one of the history-honored (Wright & Douglas, 1977, 1996; Ludlow & Haley, 1999; Wright & Stone, 1999) and reality-practiced (Chien & Shao, 2016; Chien, Shao, & Kuo, 2017) techniques for parameter estimations, has been frequently mentioned in the literature of the Rasch Model. However, no literature has ever geometrically, programmatically, algebraically, and Rasch-specifically introduced the NRIM to Rasch readers. This study thus elaborates it from a worked example, runnable codes and an online trial, general formulas of derivation, and a Rasch context of iteration.

1. Calculation of an approximate value of $\sqrt{7}$ using the NRIM (Sun, 2019)

Goal: Let $f(x) = x^2 - 7$, and search for an *x* value (>0 and marked with a red triangle) on the x-axis (Figure 1).

Step 1: Set an initial *x* (>0) at any value, say 2, and get the point (2, -3) according to the formula (=2^2-7 for the $f(2)$ on the y-axis).

Step 2: For obtaining the slope of the tangent (green) line (Figure 1), the function of the first-order derivative of the $f(x) = x^2 - 7$ is $f'(x) = 2x$. The slope at the point (2, -3) equals 4 (=2x2 according to the $f'(x)$). As such, the tangent (green) line in Figure 1 is $g(x) = 4x - 11$, where the intercept (-11) is obtained by the equation of $intercept = g(x) - slop * x = -3 - 4 * 2$.

Step 3: For having a new round of *x* value similar to the initial one mentioned in Step 1, we gain another *x* located at $\frac{11}{4}$ according to the $g(x) = 4x - 11$ if $g(x)$ is set at zero.

Step 4: Repeat the Steps from 1 to 3, a new $f(x)$ is at point $(\frac{11}{4}, \frac{9}{16})$ (Figure 1) based on the *x* at $\frac{11}{4}$. Finally, *x* approaches 2.6458($\approx \sqrt{7}$), no matter which initial *x* (>0) is chosen at the very beginning.

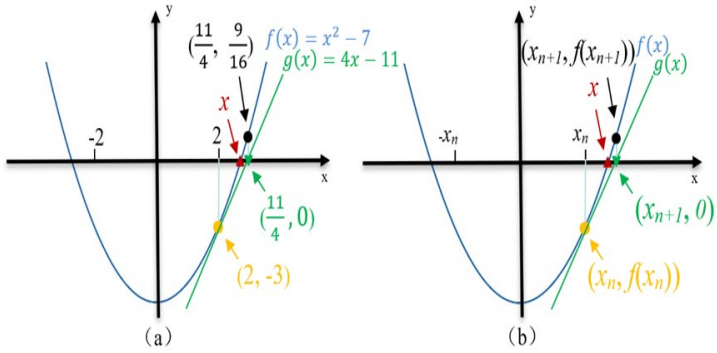

Figure 1. Functions illustrating the NRIM

2. Interpretation of the NRIM in Microsoft Office Excel VBA and an online calculator

To be more general, this article randomizes an initial value, x (45), different from the designated one (2) in Step 1. A criterion of convergence (Figure 2 with a grey highlight) is so exaggeratingly minor that efficient performance of iteration can be fully witnessed through a steep-to-flat line with markers as more rounds of iteration to be presented in an area of orange can be expected.

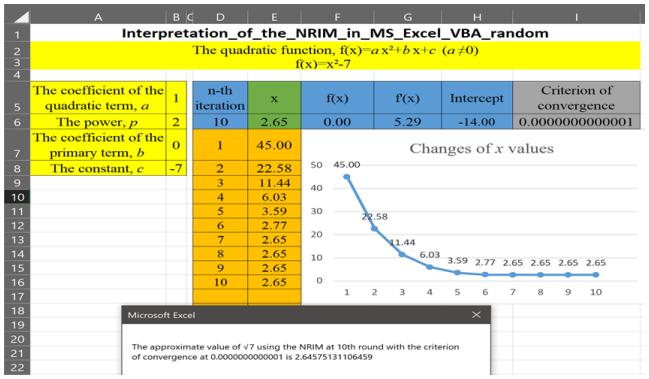

Figure 2. An interpretation of the NRIM using the MS Excel VBA

The code (on next page) illustrates how the NRIM works in a specific programing language of Microsoft Office Excel VBA (2021).

Alternatively, an online calculator (Figure 3) of CodeSansar (2021) offers a hands-on trial of the exact mechanism.

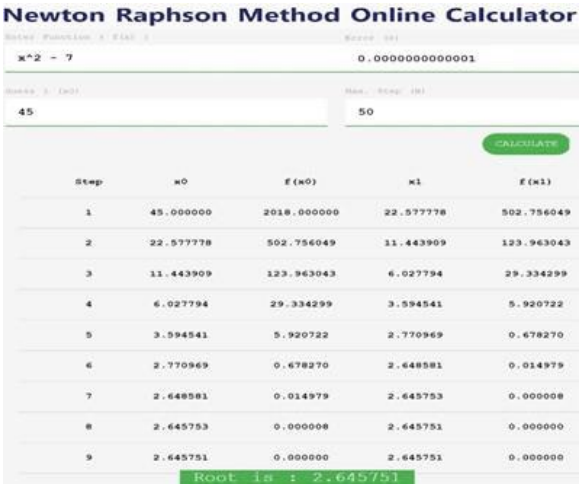

Figure 3. An interpretation of the NRIM using an online calculator

3. Generalization of the principle of the NRIM

This paper generalizes the above mentioned NRIM below:

1. Let k be the slope of the $g(x)$ defined by $k_{g(x)} = \frac{y_{n+1}-y_n}{x_{n+1}-x_n}$

2. Two points are determined by the line of $g(x)$ in Figure 2:

a. $(x_n, f(x_n))$, which is also on the function of the object, $f(x)$

b. $(x_{n+1}, 0)$ on the x-axis

3. Then $k_{g(x)} = \frac{y_{n+1}-y_n}{x_{n+1}-x_n} = \frac{g(x_{n+1})-g(x_n)}{x_{n+1}-x_n} = \frac{0-f(x_n)}{x_{n+1}-x_n} = \frac{-f(x_n)}{x_{n+1}-x_n}$

and then $x_{n+1} = x_n - \frac{f(x_n)}{k_{g(x)}}$

VBA Code

```
Public Sub Interpretation_of_the_NRIM_in_MS_Excel_VBA_random()
  Sheets("data").Range("d6:h6").ClearContents
  Sheets("data").Range("d7:e300").ClearContents
  random_number = Application.WorksheetFunction.RandBetween(1, 100)
  Sheets("data").Cells(6, 5) = random_number
  x_initial = Sheets("data").Cells(6, 5).Value
  a = Sheets("data").Cells(5, 2).Value: p = Sheets("data").Cells(6, 2).Value
  b = Sheets("data").Cells(7, 2).Value: c = Sheets("data").Cells(8, 2).Value
  convergence = Sheets("data").Cells(6, 9).Value
  Do
    For i = 7 To 100
      n = n + 1: Sheets("data").Cells(6, 4) = n          'The number of iteration
      Sheets("data").Cells(i, 4) = n
      Sheets("data").Cells(i, 5) = Sheets("data").Cells(6, 5)
      f0 = a * (x_initial ^ p) + b * x_initial + c          'The value of f(x_initial)
      Sheets("data").Cells(6, 6) = f0
      f1 = p * (x_initial ^ (p - 1))                  'The value of f'(x_initial)
      Sheets("data").Cells(6, 7) = f1
      Intercept = f0 - f1 * x_initial         'The intercept value of the tangent line
      Sheets("data").Cells(6, 8) = Intercept
      x_iterated = -Intercept / f1  'The value of a new round of x_initial, x_iterated
      If Abs(x_iterated - x_initial) < convergence Or n > 50 Then
        Exit Do
      Else
        x_initial = x_iterated: Sheets("data").Cells(6, 5).Value = x_initial
      End If
    Next i
  Loop
  MsgBox ("The approximate value of √7 using the NRIM at " & n & "th
  round with the criterion of convergence at " & convergence & " is " & x_initial)
End Sub
```

4. By the definition of the first-order derivative, $f'(x_n) = k_{g(x)}$

5. Finally, $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ or $x_n = x_{n-1} - \frac{f(x_{n-1})}{f'(x_{n-1})}$

4. Application of the NRIM on parameter estimations of the Rasch Model

The NRIM is applied in unconditional procedures for parameter estimations of the Rasch Model (Wright & Douglas, 1977). And this article only cites and clarifies the iterative adjustments for person abilities below.

Formula 0:

$$\frac{\partial log\ (1 + e^{\beta_v - i})}{\partial \beta_v} = e^{\beta_v - i}/(1 + e^{\beta_v - i}) = \pi_{vi}$$

Formula 4: $\frac{\partial \lambda}{\partial \beta_v} = r_v - \sum_i^L \pi_{vi}$

where $i = 1, L$; and $r_v = \sum_i^L x_{vi}$

Formula 5:

$$\frac{\partial^2 \lambda}{\partial {\beta_v}^2} = -\sum_i^L [\pi_{vi} * (1 - \pi_{vi})]$$

Formula 8:

$$p_{ri} = e^{b_r - d_i}/(1 + e^{b_r - d_i})$$

Formula 10:

$$b_r{}^{m+1} = b_r{}^{m} - \frac{r - \sum_i^L p_{ri}{}^m}{-\sum_i^L [p_{ri}{}^m * (1 - p_{ri}{}^m)]}$$

$$r = 1, L - 1$$

Formula 0 and Formula 8 are the same, as they share the same form as to the probability of success of a particular person on a specific item; thus, Formula 4 and Formula 5 can be renewed by replacing β_v with b_r, r_v (v from β_v) with r_r (subscript r from b_r), π_{vi} (i from $_i$) with p_{ri} (i from d_i), and x_{vi} (i from $_i$) with x_{ri} (i from d_i) to become:

Formula 4':

$$\frac{\partial \lambda}{\partial b_r} = r_r - \sum_i^L p_{ri}$$

where $i = 1, L$; and $r_r = \sum_i^L x_{ri}$

Formula 5':

$$\frac{\partial^2 \lambda}{\partial {b_r}^2} = -\sum_i^L [p_{ri} * (1 - p_{ri})]$$

And consequentially, Formula 10 becomes (if the person label *r* is ignored):

Formula 10':

$$b^{\,m+1} = b^{\,m} - \frac{\frac{\partial \lambda}{\partial b_r}^{\,m}}{\frac{\partial^2 \lambda}{\partial {b_r}^2}^{\,m}}$$

where the *m* is the rounds of iteration

In Formula 4', on the one hand, $r_r = \sum_i^L x_{ri}$ is the score of the person *v* under each item from raw data, namely, an initial and very rough estimate of ability. r_r will become $r^{\,m}$ given the omission of the person label subscript *r* and rounds of iteration, which is equal to $b^{\,m}$. On the other

hand, $\sum_i^L p_{ri} = \sum_i^L [e^{b_r - d_i}/(1 + e^{b_r - d_i})]$ is the sum of probabilities from the model based on the same person r under each item i. $(\sum_i^L p_i)^{\ m} = \sum_i^L [e^{b^{\ m} - d_i^{\ m}}/(1 + e^{b^{\ m} - d_i^{\ m}})]$ turns out when a specific person (the person label subscript r omitted) and rounds of iteration (the round label superscript m added) are taken into account. So, Formula 4' is changed into:

Formula 4'':

$$\frac{\partial \lambda}{\partial b}^{\ m} = b^{\ m} - \sum_i^L \left[\frac{e^{b^{\ m} - d_i^{\ m}}}{(1 + e^{b^{\ m} - d_i^{\ m}})}\right] = f(b^{\ m})$$

Let $x_n = b^{\ m}$, then $\frac{\partial \lambda}{\partial b}^{\ m} = f(x_n)$; and $\frac{\partial^2 \lambda}{\partial b^{\ 2}}^{\ m} = f'(x_n)$ exits because of the principle that Formula 5' is the first-order derivative of Formula 4' concerning b, namely, $(\frac{\partial^2 \lambda}{\partial b^{\ 2}})^{\ m} = (\frac{\partial}{\partial b}\frac{\partial \lambda}{\partial b})^{\ m} = \frac{\partial}{\partial b}[(\frac{\partial \lambda}{\partial b})^{\ m}] = \frac{\partial}{\partial b} f(x_n) = f'(x_n)$.

Eventually, Formula 10' is transformed into the NRIM format,

$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ or

$x_n = x_{n-1} - \frac{f(x_{n-1})}{f'(x_{n-1})}$.

5. Conclusion and Extension

Theoretically, the rationale of the NRIM is to use a rough initial estimate (i.e., an arbitrary number, say 2, in this worked example) at the very beginning; and we can iteratively adjust the value approaching the goal by using the NRIM (Ludlow & Haley, 1999). Practically, it is also explained in computer programs where the estimation process can initially start either at any value, say, a log-odds (with fewer iterations) in the dichotomous model or at zero (with more iterations) in the polytomous model (Moulton, 2003). Extensively, (1) the essence of the NRIM is a variant of 1st degree (a.k.a, the first-order linear approximation part) of the Taylor Polynomial with Peano's Reminder, $f(x) = [\sum_{k=0}^n \frac{f^{(k)}(x_0)}{k!}(x - x_0)^k] + O[(x - x_0)^n]$, provided letting $f(x_0) + \frac{f^{(1)}(x_0)}{1!}(x - x_0)^1$ be 0 (namely, x_0 and x are either x_n and x_{n+1} or x_{n-1} and x_n in the NRIM format); and (2) it remains unknown from an empirical perspective of simulation research whether other iteration methods, such as gradient descent method (GDM) widely deployed in Machine Learning (Sun, 2019), function more efficiently than the NRIM in the Rasch Model or not.

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Yang Shao
Jiaxing University, Jiaxing, Chinese mainland

Sanjay Nadkarni
Emirates Academy of Hospitality Management, Dubai, United Arab Emirates

Kailun Niu
Huzhou Vocational and Technical College, Huzhou, Chinese mainland

Tsair-Wei Chien
Chi Mei Medical Center, Tainan, Taiwan
smile@mail.chimei.org.tw

How Has Training in Rasch Measurement Evolved over the Years, and What Might It Look Like in the Future?

The text below was taken from Carol Myford's invited speech given at the 2021 Rasch Measurement SIG Business Meeting on April 10, 2021. The PDF file of the slides can be found at https://rasch.org/Myford_RaschMeasurementSIG_Speech_Spring2021.pdf

Note: The bold blue letters correspond to the slide numbers in Dr. Myford's presentation.

2. As I was considering topics for this speech, I was inspired by a podcast on Quantitude. If you have not heard of this podcast, it is co-hosted by two quantitative methodologists, Patrick Curran, from the University of North Carolina at Chapel Hill, and Greg Hancock, from the University of Maryland.

These two guys discuss a wide variety of serious quantitative topics--from Bayesian statistics and model-based thinking--to more practical topics for those who are navigating "academia and the chamber of secrets," as they describe it--from getting tenure, to applying for grants and jobs. There are also episodes that provide practical guidance for graduate students, like developing research ideas and choosing a journal for publication. Their episodes are a mix of down-to-earth seriousness and light-hearted humor. This past January they hosted an episode on the future of teaching quantitative methods that got my brain percolating.

3. Here is how Greg Hancock introduced this episode: (*play audio file on the slide*)

4. After listening to this episode, I began reflecting on how training in Rasch measurement has evolved over the years. And I started wondering about what it might look like in the future. I invite you to join me today as we look back to the past, consider the present, and then look forward to the future.

5. To do that will require time travel. For our trip, we are going to need a time machine.

Episode 1: The Past

6. For the first destination, we will head back to the 1980s to get a feel for what Rasch measurement training was like during that decade.

7. I am a big fan of the *Back to the Future* franchise. The first film was released in 1985. Michael J. Fox was cast as a small-town California teen. He travels back to the 1950s when his friend, an eccentric and

slightly wacky scientist, Doc Brown, played by Christopher Lloyd, embarks on an experiment that goes seriously awry.

8. They travel through time in Doc Brown's very classy, modified DeLorean, as you see on this slide.

9. So, that is how we will time travel back to the 1980s. Let's go!

10. To set Episode 1 of our journey in its proper historical context, this was a decade when recognition of Rasch measurement as an appropriate approach for analyzing data was problematic in some quarters, even though it had been around since the 1960s. In the 1980s, researchers using this approach sometimes encountered difficulty getting their research published. They faced rejections from editors of certain journals. To be sure, some articles did indeed get published, but it was often a steep uphill climb.

11. One very hopeful development was the founding of the Rasch Measurement SIG in 1987. It functioned as a meeting place for researchers, policy makers, and practitioners to gather to communicate about research and practice. The SIG sponsored the publication of *Rasch Measurement Transactions*, a forum for engaging with others in the Rasch community.

12. Against that backdrop, in the 1980s some (but not a lot) of universities were offering face-to-face instruction in Rasch measurement in their graduate training programs. Gerhard Fischer (2010) reminded us that as early as the 1960s and 1970s there were professors teaching about Rasch measurement in Denmark, Germany, Austria, the Netherlands, and the U.S. At some universities, professors included a unit on Rasch measurement in a larger Item Response Theory course or as a topic covered in a Theories of Measurement course, giving students an introduction to the subject. Still, in only a very few select institutions could students take in-depth, quarter- or semester-long courses devoted to the study of Rasch measurement.

13. There were precious few training materials for professors to draw upon when designing these courses. Ben Wright and Mark Stone published their classic text *Best Test Design* in 1979. That was followed in 1982 by Ben and Geoff Master's text *Rating Scale Analysis* and in 1988 by David Andrich's *Rasch Models for Measurement*. Those three books, along with the 1980 reprint of Rasch's *Probabilistic Models for Some Intelligence and Attainment Tests* (originally published in 1960) were the "Big 4" foundational readings for students

studying Rasch measurement in the U.S. in the 1980s.

I was a student in the doctoral program at the University of Chicago in the 1980s, taking courses with Ben Wright. My remembrances of those texts were that they were heavy on mathematical theory and comparatively light on application. But, on the upside, the texts gave students an introduction to the theoretical underpinnings of Rasch measurement, and they laid the foundation for future textbook development.

14. While we were attending these courses, we also learned to use software programs (Smith, 1988) to run Rasch analyses, including those shown on this slide:

BICAL, DICOT, MSCALE, MSTEPS, MFORMS, IPARM, FACETS, PC-CREDIT, BIGSCALE

15. The computers back then were quite primitive by today's standards. Just to give you some context, IBM introduced its first laptop in 1986. It weighed 12 pounds, 18 pounds lighter than IBM's "portable" computer of that time, and it cost about $2,000. Microsoft Windows 1.0 had just been launched a year earlier. To students like me taking statistics courses back in the mid-1970s, these new personal computers were revolutionary.

16. If we were to ride in Doc Brown's DeLorean even further back in time to the 1970s when I was taking statistics courses at the University of Georgia, you would see the sets of punch cards that we students created. You would see us trekking over to the university's computer center halfway across campus to hand over the punch cards to a computer operator wearing white gloves who would run our analyses on the IBM mainframe.

17. You would also see me buying my first calculator to use in my statistics courses. It cost $100—big money for a financially strapped graduate student. It had a memory and a square root key! I thought I had died and gone to heaven… but I digress.

18. Anyway, it was a gargantuan step forward in the 1980s when, as a graduate student at the University of Chicago, I could create specification files on my trusty Zenith dummy terminal, and then run analyses myself! No punch cards! No numerous treks to a campus computer center!

But here was the downside. Running analyses on that dummy terminal could take hours. I would often launch an analysis before going to bed at night. And then I would hope against hope that I had not made any mistakes setting up that specification file so that when I woke up in the morning,

the analysis would have run its course. Today, that same analysis would take mere minutes to run, if that.

19. In the 1980s, students also benefitted from some informal ways to learn about Rasch measurement. The first International Objective Measurement Workshop (IOMW) took place on the Chicago campus in 1981. It brought together practitioners from England, Australia, and America to present research and discuss their work. The second workshop was held in Western Australia in 1982, and then it was back in Chicago in 1985 and 1986, and in Berkeley, California in 1989 (Smith, 2019). Additionally, in the late 1980s Ben Wright introduced the Midwest Objective Measurement Seminars (MOMS).

Students who attended these informal workshops and seminars saw Rasch measurement in action. These gatherings provided valuable opportunities to engage in lively discussions with practitioners who were making real-world use of the measurement tools we were learning about. We used those gatherings to practice delivering presentations about our own work. We could get constructive feedback from those seasoned practitioners before we headed off to AERA or NCME to nervously give our first professional conference presentations and be truly intimidated.

So, that is the state of Rasch measurement training in the 1980s. You get the picture? Ok, then on to the present.

Episode 2: The Present

20. Time to jump back in the DeLorean with old Doc Brown at the wheel and travel to 2021. What does training in Rasch measurement look like today?

21. To set Episode 2 in its proper historical context, thankfully in 2021 there is more acceptance of researchers' use of Rasch measurement methodology. Many more journals are publishing papers in which researchers have employed Rasch measurement approaches, which is a relief. That is certainly not true of all scientific journals, but it is a far cry from the dismal situation that researchers faced in the 1980s. The Institute for Objective Measurement website has a list of over 160 "Rasch-friendly" journals that have published studies in which researchers have used Rasch measurement methodology and would likely publish more. In my view, that is simply astonishing!

22. We also need to acknowledge two journals that have provided Rasch practitioners with much-needed publication

outlets. The first was the *Journal of Outcome Measurement*, which began publication in 1997. It was followed in 2002 by its successor, the *Journal of Applied Measurement*. Many groundbreaking articles have found a home in these journals. JAM Press has also been instrumental in publishing refereed works from a variety of different disciplines that focus on measurement theory and its application in the construction of variables, again, a real boon to the field.

23. So, what does the Rasch measurement training landscape look like today, in comparison to the 1980s? We continue to see face-to-face courses included in graduate programs, likely many more than in the 1980s. As in the past, some instructors will include a unit on Rasch measurement in an Item Response Theory course or as a topic covered in a broad Theories of Measurement course. Other instructors will create Rasch measurement courses.

24. The National Council on Measurement in Education's website regularly updates a listing of universities in the U.S. and Canada that offer graduate training in educational measurement and related areas (https://higherlogicdownload.s3.amazonaws.com/NCME/c53581e4-9882-4137-987b-4475f6cb502a/UploadedImages/Documents/Grad_Programs_1219.pdf). Similarly, the website for Division 5 of the American Psychological Association maintains an up-to-date listing of doctoral programs in quantitative methods offered in the U.S. and Canada (https://www.apadivisions.org/division-5/resources/doctoral).

However, the brief program descriptions included at the NCME website do not identify those universities that provide Rasch measurement training. Indeed, even when one looks at each program's website to examine their course offerings, it is often not possible to tell whether faculty offer coursework in Rasch measurement theory.

25. Jennifer Randall and her colleagues (2021a) recently examined the course offerings in 118 graduate programs in educational measurement, psychometrics, and quantitative methods in 76 U.S. institutions. About 13-14% of the courses were educational measurement courses. Most were taught in either education or psychology departments, but, unfortunately, we do not know what percentage of those courses included Rasch measurement as a topic.

26. If you are curious about the number of doctorates awarded in the U.S. in educational measurement and related fields,

the National Science Foundation regularly provides that information. This slide shows the number of doctorates earned most recently in these fields:

(see Table 13: https://ncses.nsf.gov/pubs/nsf22300/data-tables).

27. You might also wonder where educational measurement graduate programs are located. This map shows the locations of the 120 educational measurement graduate programs in the U.S. offered in 2018 (Rios et al., 2019). Colleges and universities in the most darkly shaded states host the most programs.

(https://www.researchgate.net/publication/334995910_An_Analysis_of_College_Choice_Information_Provided_on_Graduate_Program_Websites_Implications_for_Improving_Applicant_Diversity_in_Educational_Measurement)

If you were to venture a guess, do you think that more males, or more females, have earned doctoral degrees in educational measurement-related fields in recent years in the U.S.?

28. This slide shows the most recently available data from 2019, as reported by the National Science Foundation, with females receiving about 67% of those doctoral degrees, on average:

(see Table 16: https://ncses.nsf.gov/pubs/nsf21308/data-tables).

I am very curious to know whether this finding is unique to the U.S., or whether doctoral programs in educational measurement-related fields in other parts of the world are reporting similar findings. It would also be interesting to know if students earning master's degrees in these fields would show a similar pattern.

29. This pattern of more females than males earning doctoral degrees in educational measurement appears to have picked up steam in the early 2000s (Randall et al., 2021b). On this slide, the solid line shows the number of females earning doctoral degrees, while the broken line shows the number of males. As you can see, that pattern has become even more pronounced since about 2005.

(see Figure 2: https://doi.org/10.1111/emip.12395)

30. One other intriguing gender-related development—in 2020, we witnessed the birth of a non-profit organization whose purpose is the advancement of women in educational measurement, particularly minority women. The organization is called

Women in Measurement, Inc. It has a website where you will find its mission and goals (https://www.womeninmeasurement.org/).

31. One of the biggest changes in graduate education since the 1980s is the growth of online instruction. Faculty have offered online courses in Rasch measurement theory and practice as part of master's, doctoral, and certificate programs for many years now, for example, at the University of Illinois at Chicago, where I taught (https://mesaonline.ec.uic.edu/)

Private companies and other organizations are offering online Rasch measurement courses for personal and professional development that do not require individuals to be enrolled in a graduate program. The Institute for Statistics Education through its Statistics.com website provides such training (https://www.statistics.com/courses/rasch-measurement-core-topics/; https://www.statistics.com/courses/rasch-measurement-further-topics/), as does the Australian Council for Educational Research (https://www.acer.org/au/professional-learning/postgraduate/rasch) and The Psychometric Laboratory at the University of Western Australia (https://www.uwa.edu.au/schools/medicine/psychometric-laboratory).

32. Not everyone who seeks training in Rasch measurement is looking for quarter- or semester-long courses. Some individuals are seeking training related to certain topics. Others may want to explore applications of Rasch measurement in particular fields. Still others with little or no background in statistics or measurement may be looking for brief, user-friendly introductions to Rasch measurement. To meet these diverse needs, trainers have developed short-term workshops, seminars, symposia, and summer schools. These are offered in conjunction with conferences, presented online, or delivered in-person in various venues around the world, as needs arise.

33. Building on the informal training opportunities initiated in the 1980s, we see in 2021 an expanded set of conference opportunities for students and practitioners to meet, network, and learn about ongoing research. These include the Pacific Rim Objective Measurement Symposia (PROMS), the International Outcome Measurement Conference (IOMC), the International Conference on Probabilistic Models for Measurement, the annual meetings of the UK Rasch User group, and the international meetings of the European

Rasch Training Group. Additionally, the Institute for Objective Measurement, founded in 1996, has chapters in the U.S., Italy, Korea, and Russia. These chapters provide their members with valuable opportunities to gather and exchange ideas.

Clearly, the opportunities for teaching and learning about Rasch measurement have expanded considerably since the 1980s. But what about the training materials?

34. If you go to the books section of Amazon.com and type the words "Rasch measurement," you will see an explosion of teaching resources. It is a far cry from what was available in the 1980s! There are now a whole host of publications, many with a very practical applied bent, to help make Rasch measurement more accessible to a much wider audience. Specialists from diverse fields trained in Rasch measurement have written materials to use with practitioners in their own fields, including the health sciences, science education, language assessment, the social and behavioral sciences, business, and education. There are publications that describe new classes of Rasch models. There are publications in Japanese and Italian. Additionally, there are now translations of some publications into Chinese, Spanish, and Portuguese.

35. If you want another eye-opening experience, type "Rasch measurement" in the search box of your search engine, and then click on "Videos." You will see the instructional videos that trainers have uploaded to YouTube, Vimeo, and other platforms. Additionally, at the Institute for Objective Measurement, Inc. website, you can access archived Rasch audios and videos.

Just as the training opportunities have expanded considerably since the 1980s, so have the resources for training. But what about the software programs to run Rasch measurement analyses?

36. We now have many more options to choose from. The Winsteps.com website maintains a directory of those software programs (https://www.rasch.org/software.htm). Some are free; others you must pay for. At that website, and at the National Council on Measurement in Education website, (https://www.ncme.org/resources/database), you will see software programs that implement Rasch models for analyzing dichotomous, polytomous, multidimensional, multi-level, and longitudinal data. Additionally, some

software developers have also created self-guided tutorials and user manuals to aid beginners working with their programs (for example, see https://www.winsteps.com/tutorials.htm).

37. Rasch measurement's social media presence is also proving to be a boon to training. There is the Rasch Discussion Listserv (https://mailinglist.acer.edu.au/mailman/listinfo/rasch), The Matilda Bay Club (https://mailman.wu.ac.at/mailman/listinfo/rasch), and the UK Rasch User Group (https://rasch.org.uk/). There are at least two Facebook groups that individuals can access to raise questions and get expert advice (https://www.facebook.com/groups/raschmeasurement; https://www.facebook.com/RaschModel), along with the online Rasch Measurement Forum (https://raschforum.boards.net/). All these social media resources—and others of which I am likely not aware—are creating a greater sense of community. Moreover, newcomers to the field can access help with just a few clicks on their computer keyboards.

38. So, what will Rasch measurement training look like in the future? Back in our DeLorean, and on to our next destination—the future!

Episode 3: The Future

39. It is time for some predictions. In the future, I predict that we will see continued emphasis on extending the reach of Rasch measurement training around the world. Micro-credentialing is likely to become more popular as an alternative to seeking a traditional master's or doctoral degree at much lower cost, requiring much less time to complete, and with greater relevance to career advancement (Burke, 2019; Hollands & Kazi, 2019; Ralston, 2020). Employers are increasingly recognizing the value of micro-credentialing with its shorter, skills-based targeted curricula and are viewing it as a viable route for continuous workforce development (Linkedin Learning, 2018).

40. We will also likely see the creation of more online and hybrid graduate programs. These have the potential to broaden access to Rasch measurement training for persons who are unable to participate in traditional campus-based programs. During this pandemic, professors who were teaching in universities that shut down their campuses to in-person learning had to quickly pivot to teaching online. They were forced to move their courses to a teaching and learning environment that, for many, was very unfamiliar territory. Obviously, this did not provide desirable conditions for creating and

delivering online instruction and has likely soured some faculty on this approach. Be that as it may, there is a growing literature on research-based effective online teaching strategies (e.g., Boettcher & Conrad, 2021; Kebritchi et al., 2017; U.S. Department of Education, 2010; Vai & Sosulski, 2016). I am hopeful that, in the future, faculty will choose to collaborate with instructional designers to identify and incorporate best practices for online teaching and learning.

41. What other changes might we foresee as we gaze into our crystal ball? No doubt there will be more development of software programs to run ever more sophisticated analyses on ever more powerful hardware. Surely, we will see further exploration of model development. We have an active community of Rasch model builders who will very ably carry that work forward. And I would venture to guess that there will be even more resources for teaching, particularly resources for practitioners to help them see how Rasch measurement can be of service to their fields. In my mind, these are all "givens" for the future.

42. But I want to get us thinking about challenges we will face in the next decade as we design and deliver Rasch measurement training. In the last section of this talk, I will present three challenges that we will be experiencing in the U.S., since this is the context with which I am most familiar. For those of you teaching outside the U.S., I invite you to consider these challenges, and then determine whether there are similar—or different—challenges that you and your colleagues will face in the next decade.

43. *Challenge #1: Recruit and support a next generation of students of Rasch measurement who will reflect the changing demographics of the U.S.*

44. This slide shows the population projections based on recent U.S. census figures. By 2045, the U.S. is on track to become minority White. At that point, just under 50% of the population will identify as White, about 25% will identify as Hispanic or Latino, 13% will identify as Black or African American, 8% will identify as Asian, and 4% will identify as multiracial (Poston, 2020). As the righthand figure shows, by 2060 the demographic shifts will be particularly pronounced among youth under 18. In that age group, at the beginning of 2020 racial-ethnic minorities already outnumbered individuals identified as White (Frey, 2018).

45. Given these trends, what are the racial-ethnic backgrounds of students who have most recently completed doctoral degrees in educational measurement? This slide shows

the latest data that the National Science Foundation (2019) provided for earned doctorates in 2019. About 68% of the doctoral degrees were earned by students who identified as White, 13% by students who identified as Black or African American, 9% by students who identified as Hispanic or Latino, 8% by students who identified as Asian, and 3% by students who identified as multiracial.

46. When we examine the racial-ethnic backgrounds of individuals earning doctorates in educational measurement from 1997 to 2016, we see that, on average, about 57% of the doctoral students graduating each year in educational measurement identified as White, 25% identified as Asian, 7% identified as Black or African American, and 4% identified as Hispanic or Latino (Randall et al., 2021b). As far as I know, no one is gathering this type of demographic trend data to see how this impacts the field of Rasch measurement. Nevertheless, given these sobering findings, clearly, we have much work to do if we are serious about recruiting and supporting the training of a generation of students in Rasch measurement who will reflect the changing demographics of the U.S.

47. What steps can we take to increase the racial-ethnic diversity of our field? Since the late 1990s, researchers have been asking this question and making suggestions of ways to reach that goal (e.g., Patelis et al., 1997; Sireci, 2000; Sireci & Khaliq, 2002). However, as we have just seen, not much has changed.

We are currently in a good place to have soul-searching conversations with our colleagues about how to meet this challenge, I would argue. Higher education, as we have come to know it, has been upended. During the pandemic, faculty have had to quickly initiate changes to programs that they might never have dreamed possible. As faculty return to their campuses, the time is right to have some open and honest discussions about what they could be doing differently as they move forward. That includes having some hard conversations about graduate programs, and how they might need to change to attract a more diverse student body that reflects our country's shifting demographics.

48. Listed on these next four slides are some questions to initiate those conversations. This is by no means a complete listing of all the issues that we should be addressing. However, the issues raised here are ones that researchers have indicated are important for recruiting, supporting, and retaining graduate students from underrepresented

groups (e.g., Council of Graduate Schools and Educational Testing Service, 2010; Gildersleeve et al., 2011; Okahana et al., 2016; Ramirez, 2013, 2014; Rios et al., 2019; Sowell et al., 2015).

On this first slide are a few questions to get us thinking about recruitment efforts and whether our current recruitment methods are sufficient for reaching underrepresented groups:

1. What are effective ways of recruiting applicants from underrepresented groups to our graduate program? Is relying on our graduate program's website as a recruitment tool enough, or are there other better ways to reach underrepresented groups?
2. How do we help potential applicants learn about our field and the kinds of jobs that graduates might seek?
3. What are strategies that we can use to reach out to undergraduates to help them learn about our programs?

49. This next slide lists some probing questions about our programming:

4. Do we need to rethink how we are delivering our program so that it does a better job of promoting and respecting work/family life balance?
5. Is our program too rigid in structure? For example, if we are only offering courses during daytime hours and requiring students to travel to campus to take our classes, then are we making it difficult, if not impossible, for some students from underrepresented groups who may be working fulltime and/or raising families to enroll? Are there more flexible programming options that we could consider that would make our program seem more "do-able"?

50. The third slide poses questions about our support systems, including our faculty advising systems, our mentoring, and the types of academic support we are providing:

6. Are there changes in our faculty advising, mentoring, and academic support (such as writing classes and mathematics and statistics supplements) that we should institute to help ensure that students are successful and can work steadily toward graduation?
7. What supports and resources are needed for first-year students? For doctoral students at later stages?

51. There may also be campus-wide issues of school climate that present barriers for underrepresented groups. Here are several questions that might prompt a frank discussion of school climate concerns:

8. Are there school climate concerns on campus around race, ethnicity, and class that we need to address so that students from underrepresented groups can feel welcomed and valued?
9. How can we do a better job of fostering a sense of community and cultivating a culture of diversity and inclusion on campus?

52. There are some useful resources for guidance as we consider these questions. To get us started, I would suggest these four articles as background reading (Finney & Pastor, 2012; Rios et al., 2019; Sireci, 2000; Sireci & Khaliq, 2002).

53. But once faculty have had these conversations with their colleagues, they need to follow up with concrete actions and initiatives. Our field needs to be held accountable, regularly monitoring and reporting on our efforts to meet this challenge. After 20+ years of educational measurement specialists saying that we need to diversify the field, we need to make good on that pledge.

54. Practitioners working in the field of Rasch measurement have a critical role to play in this effort, even if they are not employed in academe. For example, practitioners can assist with recruiting, mentor students, give guest lectures and seminars, review graduate program curricula and course syllabi, sponsor internship and work-study experiences in their organizations, and, in some cases, perhaps provide tuition assistance or much needed scholarship support. Bottom line--We all need to show in visible ways that we are up to this challenge. Now, on to the second challenge.

55. *Challenge #2: Consider the possible redesign of the scope and sequence of courses offered in graduate programs to better prepare students for work in the educational measurement field.*

56. Over the last several years, I have had the privilege of collaborating with colleagues from Boston College--Mike Russell, Larry Ludlow, and Laura O'Dwyer--to help launch a new doctoral program in educational measurement and testing in Russia funded by the World Bank (https://ioe.hse.ru/en/news/217128066.html). The Higher School of Economics at the National Research University in Moscow is the first university in Russia to offer this type of doctoral program. As such, this program does not have to compete with existing programs, as would be the case if my Boston College colleagues were designing a new program for a university in

the U.S. Instead, they could think critically about existing programs and their shortcomings, while envisioning new possibilities for organizing curricula in our field. Under the able direction of Elena Kardanova, faculty at National Research University are implementing this innovative doctoral program for the first time.

57. In a 2019 article in *Educational Measurement: Issues and Practice* Mike Russell and his colleagues described this effort. They reviewed some doctoral programs offered in the U.S. and presented some intriguing ideas for curricular revision based on their work with their Russian colleagues. They argued that it is time for our field to step back from "the way we have always done it" to consider a redesign of the scope and sequence of coursework in educational measurement.

58. Russell and his colleagues traced the history of curriculum development in educational measurement. They noted that to keep up with the development of new theories and methodological advances in the field over the last 100 years, faculty have resorted to "tacking on" new courses without any meaningful discussion of the sequencing of courses included in their program of study.

59. That has resulted in "a disjointed conception of educational measurement that separates assessment system design, instrument development, analytic methods, and test score reporting and use into discrete subfields rather than developing a holistic and integrated conception of the measurement process" (Russell et al., 2019, p. 78). Students in "tack-on" programs are not well served by the resulting repetitive and disjointed treatment of topics. Of most concern, students can complete their graduate program without having a clear understanding of how instrument design and development connects to psychometric analyses.

60. Russell and his colleagues called for the creation of an integrated course of study "constructed around the full life cycle of the development and use of an instrument" (Russell et al., 2019, p. 85). They provided an example of an integrated scope and sequence of topics in educational measurement and invited others to consider alternate sequencing. Once faculty have adopted a sequence of topics, then redesign of the curriculum can proceed in a manner that would reduce repetition while treating topics in a more integrated and iterative manner.

I encourage you to read their article and then consider the implications of their proposal for training in Rasch measurement. What part would Rasch measurement training play in the development of an integrated course of study? How would teaching about Rasch measurement as part of an integrated course of study differ from the way in which we currently approach training?

I agree with my Boston College colleagues that it is time to look critically at our "tack-on" approach to curriculum design to ask if continuing to add more and more courses to our curricula really leads to graduates who have acquired the knowledge, skills, abilities, and dispositions needed for the varied roles they may assume after leaving the academy. I am not convinced that it does, and I worry about whether the training that students are receiving in our graduate programs adequately prepares them for the educational measurement jobs of the future, which brings me to the third challenge.

61. *Challenge #3: Collaborate with employers of graduates from master's and doctoral programs in educational measurement (1) to ensure that students are well prepared for the demands of the workplace, and (2) to provide students with the information and resources they need to make informed choices when considering career options outside academia.*

62. Where do graduates from doctoral programs in educational measurement find jobs? This slide shows the post-graduation employment data for 1997-2016 (Randall et al., 2021b). Many students secured jobs in university settings (52%, on average) (the solid black line at the top of the chart). About 30% on average took jobs in industry or were self-employed as private consultants (the solid gray line). Another 10% chose to work in other educational institutions, such as school districts (the broken black line), and about 9% took jobs in government (the broken gray line at the bottom of the chart). Unlike many fields, graduates from our programs have had multiple opportunities for employment in both public and private sector jobs for decades now.

63. As we look to the future, there will likely be fewer opportunities for graduate students hoping for full-time, tenure-track positions in academia. According to the American Association of University Professors (2021), the prospects for finding gainful employment in full-time, tenure-track positions are bleak. Currently, more than half of all faculty appointments are for part-time positions. Universities are

increasingly offering only non-tenure-track appointments. Those now account for over 70 percent of all staff appointments in higher education in the U.S.

Given these discouraging hiring trends in higher education, it is a safe bet, I would argue, that in the future, students graduating from our programs will be seeking employment in settings outside academia, even more frequently than in the past.

64. If that is indeed the case, then faculty in our graduate programs need to be establishing and maintaining strong, ongoing collaborative relationships with employers of our students who are working in industry and in government. By creating advisory committees that include employers, faculty can obtain the employers' input and expertise to review graduate programs, curricula, and course syllabi. Employers can provide advice and feedback about the program and the on-the-job performance of its graduates, helping faculty to determine whether students in their programs are adequately prepared to meet employer demands for workforce expertise (Wendler et al., 2012).

65. Faculty need to understand employers' expectations regarding the knowledge, skills, abilities, and dispositions that they presume that graduates will have acquired. However, too often faculty assume that they know what graduates need to be successful in job settings outside the academy, but that may not be true. Asking employers to share job descriptions for positions that graduates will fill can help faculty become aware of the tasks that new hires will be expected to perform. Additionally, faculty can call on employers to assist in providing career counseling services to acquaint graduate students with the range of jobs available to them so that students will have the knowledge they need to make informed decisions when they consider job opportunities in industry and government.

I have presented three challenges that those providing Rasch measurement training in the next decade will face. I am sure that there are many more, but these three seem especially pressing to me. I invite your comments and suggestions of ways to meet these challenges. I would also be curious to hear your predictions for the future, and whether you think any of my predictions are off target.

66. So, this brings me to the end of my prepared remarks. I hope you have enjoyed our time travel in Doc Brown's supercharged, retrofitted, plutonium-powered DeLorean. What a rush!

For those of you in the younger generation who have never seen any of the *Back to the Future* films, I hope that through this presentation I have aroused your curiosity so that you will look for them on Amazon Prime.

67. And now, on behalf of Doc Brown, Marty McFly (and me), thank you for accompanying us on this whirlwind tour of Rasch measurement training--past, present, and future. I look forward to hearing your thoughts on where we are headed next.

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Carol Myford
Emerita Professor
University of Illinois at Chicago

Rasch-Related American Educational Research Association (AERA) Presentations and events

Rasch Measurement SIG Business Meeting
Time: Monday, April 25, 6:00-7:30 p.m. PDT, SIG-Rasch Measurement Virtual Paper Session Room

Thursday, April 21, 2022

- Assessing Student Learning from a Cognitive Perspective: Challenges and Innovations Paper Sessions
  - *Time:* Thursday, April 21, 8:00-9:30 a.m. PDT Marriott Marquis San Diego Marina, North Building, Lobby Level, Marriott Grand Ballroom 2
  - *Paper:*
    - A Theory-Based Approach to Algorithmic Generation of Mental Rotation Items
      – H. Luo, X. Yang, East China Normal University, G. Li Department of Curriculum & Instruction, East China Normal University

- Project-Based, Problem-Based, and Justice-Based Pedagogies Supporting Science Teaching and Learning Paper Session
  - *Time:* Thursday, April 21, 8:00 to 9:30am PDT, Marriott Marquis San Diego Marina, Floor: North Building, Lobby Level, Rancho Santa Fe 2
  - *Paper:*
    - Development and Validation of an Instrument to Evaluate Ninth-Grade Students' Context-Based Chemistry Problem-Solving Skills
      – S. Chi, Z. Wang, East China Normal University

- AERA Roundtable Session 3
  - *Time:* Thursday, April 21, 11:30 a.m.-1:00 p.m. PDT San Diego Convention Center, Exhibit Hall B
  - *Papers:*
    - Supporting Inclusion Using Multimodal Comics: The Power of Comic Experience in Promoting Integrative Inferential Reasoning
      – A.M. Blum, Stanford University, J.M. Mason, University of California Berkeley

- Division H Graduate Student Poster Session: Fresh Perspectives on Research, Evaluation, Assessment, and Accountability in Schools
  - *Time:* Thursday, April 21, 4:15-5:45 p.m. PDT Marriott Marquis San Diego Marina, Floor: North Tower, Ground Level, Pacific Ballroom 18
  - *Papers:*
    - Examine the Mathematics Classroom Observation Protocol for Practices (MCOP2) Dimensionality Using the Many-Facet Rasch Modeling
      – C. Niu, University of Incarnate Word

Friday, April 22, 2022

- AERA Poster Session 3
  - *Time:* Friday, April 22, 8:00-9:15 a.m. PDT San Diego Convention Center, Floor: Upper Level, Sails Pavilion
  - *Papers:*
    - An Exploratory Quantitative Text Analysis Approach for Synthesizing Research Articles
      – *C. Stager, S.A. Wind, C. Hua, University of Alabama*

- Item Development Paper Session
  - *Time:* Friday, April 22, 11:30am to 1:00pm PDT Manchester Grand Hyatt, Floor: 2nd Level, Harbor Tower, Gaslamp AB
  - *Papers:*
    - Development of an Instrument to Assess Middle School Students' Online-Metacognitive Competency in Solving Chemistry Problems
      – *Y. Zeng, S. Chi, Z. Wang, East China Normal University, X. Zhuang*
    - Developing Model-Based Reasoning Assessment Tasks to Investigate the Efficacy of High School Biology Instructional Materials
      – *C.F. Hermann-Abell, B.M. Donovan, E. Harris, J. Snowden, M.A.M. Stuhlsatz, BSBC Science Learning, C.D. Wilson, Biological Sciences Curriculum Study*

- Classroom Assessment Trends in the United States and Internationally Poster Session
  - *Time:* Friday, April 22, 4:15-5:45 p.m. PDT SIG Virtual Rooms, SIG-Classroom Assessment Virtual Poster Session Room
  - *Papers:*
    - The Development and Validation of the Teacher Formative Assessment Literacy Scale
      – *Z. Yan, The Education University of Hong Kong, S. Pastore, University of Bari, Italy*

Saturday, April 23, 2022

- Applications of the Rasch Model Poster Session (San Diego)
  - *Time:* Saturday, April 23, 8:00-9:30 a.m. PDT San Diego Convention Center, Floor: Upper-Level Sails Pavilion
  - *Papers:*
    - Validating the Flourishing Scale for Immigrant College Students
      – *R. Sosa, Lehigh University*

- Assessment and Student Achievement in Schools Poster Session (San Diego)
  - *Time:* Saturday, April 23, 11:30 a.m.-1:00 p.m. PDT San Diego Convention Center, Floor: Upper-Level Sails Pavilion
  - *Papers:*
    - Rasch Scaling of Standards-Based Grades as a Summative Measure of Student Achievement
      – *M. Barnes, Columbus City Schools, B. Gimbert, The Ohio State University*

- Equity in Science Assessment and Measurement Paper Session
  - *Time:* Saturday, April 23, 2:30-4:00 p.m. PDT Marriott Marquis San Diego Marina, Floor: South Building, Level 3, Catalina

- *Papers:*
  - Applying Rasch Measurement to Validate the Colorado Learning Attitudes About Science Survey
  – *L. Shi, The University of Georgia*

- Differential Item Functioning and Measurement Invariance Paper Session
- *Time:* Saturday, April 23, 4:15-5:45 p.m. PDT Division Virtual Rooms, Division D - Section 1: Educational Measurement, Psychometrics, and Assessment Virtual Paper Session Room
- *Papers:*
  - Differential Item Functioning Detection Using Data Mining Techniques: Identifying Additional Sources of Unfairness in Educational Measurement
  – *M.-T. Lo, National Yang Ming Chiao Tung University*

- Global Perspectives on Higher Education Paper Session
- *Time:* Saturday, April 23, 4:15-5:45 p.m. PDT World Educational Research Association Virtual Meeting Rooms, WERA Virtual Meeting Room 1
- *Papers:*
  - Development and Validation of an Instrument Measuring Postgraduates' Holistic Development
  – *M.W.T. Cheng, S.-K. Lo, Education University of Hong Kong*

Sunday, April 24, 2022

- Poster Session 2
- *Time:* Sunday, April 24, 9:45 a.m.-11:15 a.m. PDT Virtual Poster Room 1
- *Papers:*
  - Rasch Rating Scale Analysis of the 10-Item Connor-Davidson Resilience Scale in International Scholars and Students
  – *Y.-R. Ku, The University of Alabama, Tuscaloosa*

- Defining and Operationalizing Sociocultural Competence in Dual-Language Education Symposium
- *Time:* Sunday, April 24, 2:30-4:00 p.m. PDT Manchester Grand Hyatt, Floor: 3rd Level, Seaport Tower, Hillcrest CD
- *Papers:*
  - A Rasch/Guttman Scenario Scale to Measure Teachers' Promotion of Sociocultural Integration
  – *M.E.B. Cruz, Georgia Institute of Technology*

- Applications of the Rasch Model Poster Session
- *Time:* Sunday, April 24, 4:15-5:45 p.m. PDT Virtual Poster Room 1
- *Paper:*
  - Validation of the Self-Determination, Purpose, Identity, and Engagement in Scient Survey Using Rasch Modeling
  – *H. Huvard, New Mexico State University, C. Donovan, R.M. Talbot, University of Colorado, Denver*

Monday, April 25, 2022

- Measurement and Evaluation Research from a Global Perspective Paper Session

- *Time:* Monday, April 25, 8:00-9:30 a.m. PDT San Diego Convention Center, Floor: Upper Level, Room 9
- *Paper:*
  - A Rasch Examination of Model Fit and Differential Item Functioning Between Paper-Pencil and computerized Tests
  – *M.T.S. Alahmadi, The National Center for Assessment*

- Validity and Instrument Development in Professions Education Paper Session
- *Time:* Monday, April 25, 8:00 to 9:30am PDT, Manchester Grand Hyatt, Floor: 2nd Level, Harbor Tower, Balboa C
- *Paper:*
  - Validation of a Peer Observation for Teaching Evaluation Tool
  – *Y. Jia, Rutgers University, A. Spagnolo, S. Luther*

- AERA Virtual Poster Session 6, Division C Section 1D: Science Poster Session 2
- *Time:* Monday, April 25, 9:45-11:15 a.m. PDT AERA Virtual Poster Rooms, AERA Virtual Poster Room 1
- *Papers:*
  - Research on Students' Learning Progression of the Interdisciplinary Science Concept of Stability and Change
  – *S. Chi, Z. Wang, Y. Zhang, Y. Zhu, East China Normal University*

- Rasch Models: Considerations of Use Paper Session
- *Time:* Monday, April 25, 9:45-11:15 a.m. PDT Virtual Paper Session Room
- *Papers:*
  - Functional Clustering for Diagnosing Person Misfit
  – *K. Turner, University of Georgia, Athens, G. Engelhard, University of Georgia*
  - Identifying Response Styles Using Person Fit Analysis and Response-Styles Models
  – *S.A. Wind, Y. Ge, University of Alabama*
  - Identifying Zones of Targeted Feedback for Writing with Unfolding Models
  – *Y. Yuan, G. Engelhard, University of Georgia*
  - Measuring Student Success as a Latent Construct with a Partial-Credit Rasch Model
  – *H. Huvard, New Mexico State University, C. Donovan, R.M. Talbot, University of Colorado, Denver*

Tuesday, April 26, 2022

- AERA Poster Session 1
- *Time:* Tuesday, April 26, 9:45-11:15 a.m. PDT AERA Virtual Poster Room 1
- *Papers:*
  - An Application of a Structured Mixture Rasch Model to Computer Adaptive Data
  – *M. Langi, NWEA*

- Measurement and Statistical Modeling Paper Session
- *Time:* Tuesday, April 26, 4:15-5:45 p.m. PDT Division Virtual Rooms, Division D -

Section 1: Educational Measurement, Psychometrics, and Assessment Virtual Paper Session Room

- *Papers:*
  - Diagnostic Classification Models for Analyzing Examinees' Responses to a Large Number of Small and Similar Tasks
  – *R. Liu, H. Liu, University of California Merced, D. Shi, University of South Carolina, Z. Jiang, Peking University*

Women in Measurement Announcements

Women in Measurement is a non-profit organization dedicated to the advancement of gender and racial equity in educational measurement.

Their annual Networking Reception will be held at the Garden Terrace at the Westin Gaslamp in San Diego on Friday April 22nd from 6:15-7:30 PDT. The event is dedicated to the 2022 Women in Measurement Leadership Award recipient, Dr. Barbara Dodd. Please register in advance here: https://www.eventbrite.com/e/2022-women-in-measurement-networking-reception-tickets-271289132097.

The deadline for the Women in Measurement research fellowship proposal is May 31, 2022. Information is available here: https://www.womeninmeasurement.org/fellowship.html

To learn more about the organization and sign up for the monthly newsletter, visit www.womeninmeasurement.org.