ARMChapter8.pdf: Applying the Rasch Model 4 th ed. Chapter 8: Guilford's Data	
We will analyze the ratings of seven junior scientists on five creativity traits by three senior Scientists (after Guildford, 1954, p.282) using ARMfacets.	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Launch ARMsteps from the short-cut on your desktop or from the Windows "Start" menu.	ARMsteps
Launch ARMfacets from the ARMsteps menu bar	Files Edit Analysis Data files Tutorials Help ARMfacets ARMsteps Contr
The ARMfacets screen displays. We are going to follow the instructions in the yellow box. Click on "Display Tutorial" to display this tutorial - <i>unless it is already open on your screen.</i>	ARMfacets iles Edit Font Estimation Output Tables & Plots Output Files Graphs Help IMFacets (Facets for Applying the Rasch Model) Version No. 3.83.0 C 1 rights reserved. IMFacets is limited to 2,000 observations 1/26/2020 4:55:12 PM Durrent folder: C:\ARM4\ARMFacts Editor = notepad.exe lae Files pull-down menu for Specification File Name, or Ctrl+O Velcome to ARMfacets ! Welcome to ARMfacets, a version of Facets adapted for "Applying the Basch Model" 1. For the Tutorial, click the blue button. It is a PDF file displayed by Adobe Reader or equivalent. 2. Click on the ARMfacets "Files" menu. Then click on "Specification file name?" Click on "ARMChapter8.txt" for the analysis in Chapter 8. OK Thanks, I don't need to see this again
This tutorial, ARMChapter8.pdf, displays. If not, you might need to download and install Adobe Reader.	RM4Chapter8.pdf: Applying the Rasch Model 4 th ed. Chapter 8: Guilford's Data Ratings of seven junior scientists on five creativity trais by three senior Scientists (after Guildford, 1954, p.283). Please install ARM/access on your computer by double- clocking on ARM/access file which you downloaded from the book website. Launch ARM/access file which you downloaded from the book website. Launch ARM/access file which you downloaded from the book website. Description of the book website. Launch ARM/access file which you downloaded from the book website. Description of the book website. Launch ARM/access from the book website. Launch ARM/access from the instructions in the yellow box. Click on "Display Tutorial" to display this tutorial- unless fi is already open on your screen.
Close the "Welcome" box by clicking "OK".	Welcome to ARMfacets ! × Welcome to ARMfacets, a version of Facets adapted for "Applying the Rasch Model" Display Display 1. For the Tutorial, click the blue button. It is a PDF file displayed by Adobe Reader or equivalent. Download Adobe Reader 2. Click on the ARMfacets "Files" menu. Then click on "Specification file name?" Click on "APMChapter8.txt" for the analysis in Chapter 8. OK OK Thanks, I don't need to see this again

Click on the ARMfacets "Files" menu. Click on "Specification File Name?"	Files Edit Font Estimation Specification File Name? Exit
Select "ARMChapter8.txt" in your filename list Click on "Open"	What is the Specification file name? × • • • • • • • • • • • • • • •
"Extra specifications?" Click "OK".	Extra Specifications?: F1 for Help Extra specifications (or click OK) in the format: iter=1 arrange=m with no spaces within specifications, and at least one space between them. OK Specification Cancel Help Help
What is the Report Output file name? Click "Open" to accept the suggested name of "ARMChapter8.out.txt"	Image: State Stat
The ARMfacets analysis is performed.	SortingSorted Table 14.1.3.2 Bias/Interaction Pairwise Report (arranged by N) SortingSorted Analyzed in time of 0: 0: 7 Subset connection O.K. Output to C:\ARM4\ARMfacets\ARM-data\ARMChapter8.out.txt
The Output file, ARMChapter8.out.txt, is displayed by NotePad.	ARMChapter8.outbt - Not File Edit Format View Help ARMFacets (Facets for Applying the Rasch Model) Version No. 3.83.0 Copyr ARMFacets is limited to 2,000 observations 2/26/2020 5:08:07 PM ARMFacets: Ratings of Scientists (Psychometric Methods p.282 Guilford 195 Table 1. Specifications from file "C:\ARM4\ARMFacets\ARM-data\ARMChapter8 Title = ARMFacets: Ratings of Scientists (Psychometric Methods p.282 Guil Data file = (C:\ARM4\ARMFacets\ARM-data\ARMChapter8.txt) Output file = C:\ARM4\ARMFacets\ARM-data\ARMChapter8.out.txt ; Data specification Facets = 3 Delements = N Non-centered = 1 Positive = 2 Labels = 1.Senior scientists ; (elements = 3) 2.Junior Scientists ; (elements = 7) 3.Traits ; (elements = 5) Model = ?B, ?B, ?, R9, 1

Let us first look at the specification and data file for Guilford's dataset. Click on "Edit" menu. Click on "Edit Specification =\ARMChapter8.txt"	Edit For Estimation Output Tables & Plots Output Files Graphs Help Edit Specification = C:\ARM4\ARMfacets\ARM-data\ARMChapter8.txt
The ARMChapter8.txt control instructions and data are displayed on your screen. The data set consists of ratings on 5 items of Creativity awarded by 3 Senior Scientists, the judges, to 7 Junior Scientists. The ratings are on a scale from 1 to 9. We just used the A, B, C convention to invent names for those persons.	ARMChapter8.txt - Notepad File Edit Format View Help ; ARMChapter8.txt data file: Analyze this with ARMfacets Title = ARMfacets: Ratings of Scientists (Psychometric Methods p.282 Guilford Facets = 3 ; three facets: judges (senior scientists), examinees Inter-nater = 1; facet 1 (senior scientists) have greater creativity with Non-centered = 1 ; examinees and items are centered on 0 Hogs, judges, examinees and items produce ratings with me ; A bias/interaction analysis, 28,28 will report interactions between fac Labels = 1, Senior scientists ; name of first facet: judges 1 = Anne 2 = Braty 3 = Cavendish * 4 = David 5 = Edity 1 = Anne 2 = Betty 3 = Chris 4 = David 5 = Edity 7 = George * 3, Traits ; name of third facet: items
The top section of ARMChapter8.txt specifies the analysis. Everything after a ";" is a comment to help you understand / remind you about the meaning of the command. It is ignored by the software.	; ARMChapter8.txt data file: Analyze this with ARMfa Title = ARMfacets: Ratings of Scientists (Psychometr: Facets = 3 ; three facets: judges (seni- Inter-rater = 1; facet 1 (senior scientists) is the Positive = 2 ; examinees (junior scientists) have Non-centered = 1 ; examinees and items are cen- Model = ?B,?B,?R9 ; judges, examinees and items
The middle section of ARMChapter8.txt starting "Labels=" identifies the three facets (Senior scientist, Junior Scientist, Trait) and the elements within each facet (e.g, Avogradro, Betty, Clarity).	Labels = 1. Senior scientists 1 = Avogato 2 = Brahe 3 = Cavendish 2. Junior Scientists 1 = Anne 2 = Betty 3 = Chris 4 = David 5 = Edward 6 = Fred 7 = George 3. Traits 1 = Attack 2 = Basis 3 = Clarity 4 = Daring 5 = Enthusiasm 4 = Daring 5 = Enthusiasm 4 = Daring 5 = Enthusiasm 4 = Daring 5 = Enthusiasm
The bottom section of ARMChapter8.txt starting "Data=" contains the data. Each line has the element numbers for the 3 facets, and then the observations for those elements. e.g., Line 1 Avagadro rated Anne on five criteria: 5,5,3,5,3 Line 2 Avagadro rated Betty on five criteria: 9,7,5,8,5 Last Line Cavendish rated Fred on five criteria: 7,7,7,5,7	Data= 1,1,1,1=5,5,5,3,5,3 1,2,1=5,9,7,5,8,5 1,3,1=5,3,3,3,7,1 1,4,1=5,7,3,1,3,3 1,5,1=5,9,7,7,8,5 1,6,1=5,3,5,3,5,1 1,7,1=5,7,7,7,5,5,5 2,1,1=5,6,5,4,6,3 2,2,1=5,8,7,5,7,2 2,3,1=5,4,5,5,6,4,5,5 2,4,1=5,5,6,4,5,5 2,5,1=5,2,4,3,2,3 2,6,1=5,4,4,6,4,2 2,7,1=5,3,3,5,5,4 3,1,1=5,5,5,5,7,3 3,2,1=5,4,5,5,5,5,5 3,3,1=5,3,5,5,5,5 3,4,1=5,5,3,3,3,1 3,5,1=5,9,7,7,7,7,5,7 ; last line of data, and end of file
Now let's look at the Output file, ARMChapter8.out.txt. This has already been displayed. Click on it on the Task bar or in the ARMfacets Edit Menu	Edit Font Estimation Output Tables & Plots Output Files Graphs Help Edit Spectration = C:\ARM4\ARMfacets\ARM-data\ARMChapter8.txt Edit Report Output = C:\ARM4\ARMfacets\ARM-data\ARMChapter8.txt

The first part of the Output file is Table 1. This reports the specifications that controlled the analysis.	ARMfacets: Ratings of Scientists (Psychometric Methods p.282 G Table 1. Specifications from file "C:\ARM4\ARMfacets\ARM-data\. Title = ANNFacets: Ratings of Scientists (Psychometric Methods Data file = (C. ARM4\ARMfacets\ARM-data\ARMChapter8.txt) Output file = C:\ARM4\ARMfacets\ARM-data\ARMChapter8.out.txt
For the data used to construct ARM, Fig. 8.1, scroll down to ARMfacets Table 7.2.1. This shows the Junior Scientists in measure order (descending). Betty is rated as most creative (highest measure, 0.64 logits). Fred is rated as least creative (lowest measure, -0.56 logits).	Table 7.2.1 Junior Scientists Measurement Report (arranged by ml). Total Total Obsid Fair(M) + Redei Infit Outfit Estim. Correlation N Score Const Average Merrage Media Scientific Outfit Estim. Correlation N N 94 15 6.27 6.38 6.64 .18 6.61 -1.1 .60 1.21 1.31 .65 .47 2 District Scientific .64 .17 1.94 2.1 .41 .51 .64 .51 .11 .60 .12 1.30 .65 .47 .54 .64 .87 .19 .42 .23 .21 .45 .48 .61 .11 .60 .12 .1.30 .45 .45 .64 .87 .23 .21 .45 .48 .64 .77 .23 .21 .23 .21 .23 .21 .45 .46 .37 .48
In ARMfacets Table 7.3.1 are the items. Daring and Attack are the easiest items to satisfy (lowest measure). Enthusiasm the most difficulty (highest measure, 0.50 logits). (These item labels are not the original ones - they are now lost.)	Table 7.3.1 Traits Measurement Report (arranged by ml). Total Total Obsvd Fair(M) - Model Infit Outfit [Estim. Correlation 5core Count Average Average Measure 5.6. MsSq 25td MsSq 25td [Discre] PtMea PtExp N Traits 79 21 3.76 3.69 520 .15 1.22 .7 1.29 .9 .85 .49 .56 5 Enthusiam 92 21 4.38 4.33 .20 .35 1.22 .7 1.24 .9 .85 .49 .56 5 Enthusiam 92 21 4.38 4.33 .20 .35 1.22 .7 1.24 .9 .85 .49 .56 5 Enthusiam 128 2.1 5.43 3.54 .27 .5 .81 .5 1.34 .56 .50 .51 .44 .56 .56 1.41 .56 .56 1.51 .22 .51 .58 A Daring 115 21 5.48 5.59 29 .15 .89 .37 .31 .52 .51 .58 A Daring
Back up to ARMfacets Table 7.1.1, are the Senior Scientists, the judges. Brahe is most severe (highest measure, 0.24 logits)	Table 7.1.1 Senior scientists Measurement Report (arranged by eW). Total Total Goved Fair(M)] Model I Infit. Gardit. [State.] Correlation [Start Agree.] Score Cont Average Average[Heaure 5.1. Model 2540 [Discore] 156 55 4.66 4.39 20 11.42 1.7 1.43 1.6 158 55 4.66 4.39 2.2 158 55 4.66 4.39 2.4 158 55 4.66 4.39 2.4 158 55 4.66 4.39 2.4 158 55 4.66 4.39 2.4 158 55 4.66 4.39 2.4 158 55 4.66 4.39 2.43 158 5.17 5.87 1.46 1.6 1.6.8 158 5.17 5.57 5.53 1.56 1.5 1.75
ARM Fig. 8.2 shows these results summarized as measurement rulers. Scroll back up to ARMfacets Table 6.0	Table 6.0 All Facet Vertical "Rulers". Vertical = (1A,2A,3A) Yardstick (columns lines low high extreme)= 0,10,-1,1,End Image: Senior scientists +Junior Scientists -Traits Image: Senior scientists -Traits
Along the top row of the Table are the facet names. The "-" or "+" next to the name provides the orientation. "+" means that biggest average ratings are at the top. So that "+Junior Scientists" means that Betty has the highest average ratings. "-" means that the smallest average ratings are at the top, so "-Traits" means that Enthusiasm received the lowest average ratings, and so is the most difficult item.	I I
On the right-hand side is the rating scale. "" indicates a half-score point. The difference between the leniencies of the Senior Scientists is less than a score-point. The Junior Scientists differ by almost 3 score-points.	
Chapter 8 Going Further: ARM Fig. 8.4 shows the results of two separate analyses cross-plotted. But we can see a similar result from this analysis.	



"Table 4 Request" "Unexpected standardized residuals to report=" Type in "2" Click on "Temporary Output File"	Table 4 Request: F1 for Help Image: Comparison of the standardized residuals to report Image: Comparison of the standardized residuals to report Image: Comparison of the standardized residuals to report Image: Comparison of the standardized residuals to report Image: Comparison of the standardized residuals to report Image: Comparison of the standardized residuals to report Image: Comparison of the standardized residuals to report Image: Comparison of the standardized residuals to report = Image: Comparison of the standardized residuals to report = Image: Comparison of the standardized residuals to report = Image: Comparison of the standardized residuals to report = Image: Comparison of the standardized residuals to report = Image: Comparison of the standardized residuals to report = Image: Comparison of the standardized residuals to report = Image: Comparison of the standardized residuals to report = Image: Comparison of the standardized residuals to report = Image: Comparison of the standardized residuals to report = Image: Comparison of the standardized residuals to report = Image: Comparison of the standardized residuals to report = Image: Comparison of the standardized residuals to report = Image: Comparison of the standardized residuals to report = Image: Comparison of the standardized residuals to report = Image: Comparison of the standardized residuals to report = Image: Comparison of the standar
Tables 4 displays, reporting <i>significantly misfitting</i> observations. Notice that Brahe features in all of them!	Table 4.1 Unexpected Responses (4 residuals sorted by u).Cat Score Exp. Resd StResN Senior sc N Junior N Traits226.0-4.0-2.72Brahe5Edward 1 Attack226.1-4.1-2.72Brahe5Edward 4 Daring662.93.12.42Brahe3Chris 5Enthusiasm662.93.12.42Brahe6Fred3ClarityCat Score Exp. Resd StResN Senior sc N Junior N Traits
This concludes this example in ARM. But there is one more aspect we could look at: the use of the rating scale. Rating Scale use is discussed in ARM Chapter 11. Back to the ARMfacets analysis	
Click on "Output Tables & Plots" Click on "Table 8: Rating (or partial credit) scale Structures"	Output Tables & Plots Output Files Graphs Help Table 4: Unexpected Observations Table 5: Measurable Data Summary Table 5: Measurable Data Summary Table 6: Vertical Rulers Table 7: Measures Table 8: Rating (or partial credit) scale Structures
Leave "All" checked Click on "Temporary Output File"	Table 8 Request: F1 for Help - × Table 8: Rating Scale Structure Select Facet: All Output to Select Subtables: Modify Output to Vertications Temporary Output to Select Subtables: Modify Output to Vertications Temporary Output Tile Vertications Temporary Output Tile Vertications Temporary Output Tile

Table 8 displays.	Table 8.1 Category Statistic
Look down the 9 categories. Three categories (Cats 3, 5	Model = ?B,?B,?,R9
& 7) have noticeably higher frequencies than the other 6	DATA
categories. The judges were asked to discriminate 9	Category Counts
levels of Creativity. These data appear to be telling us	Score Total Used %
that, in practice, the judges discriminated only 3 levels	1 4 4 4%
clearly.	
Find out more about constructing meaningful rating	3 25 25 24%
scales in ARM Chapter 11	4 8 8 8%
seales in Anton Chapter 11.	5 (31) 31 30%
	6 6 6%
	7 (21) 21 20%
	8 3 3 3%
	9 3 3 3%
	+
Close all open windows	\boxtimes