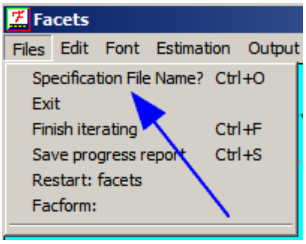
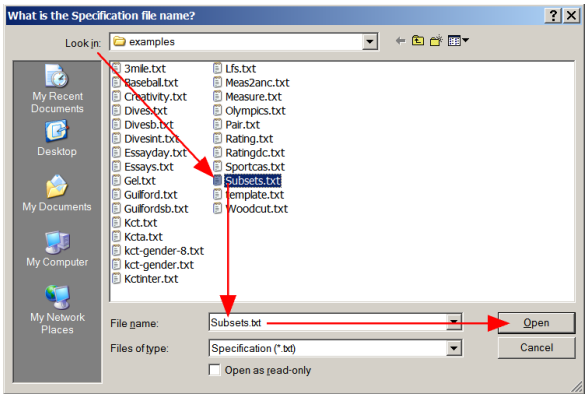
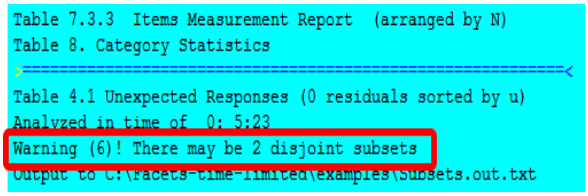
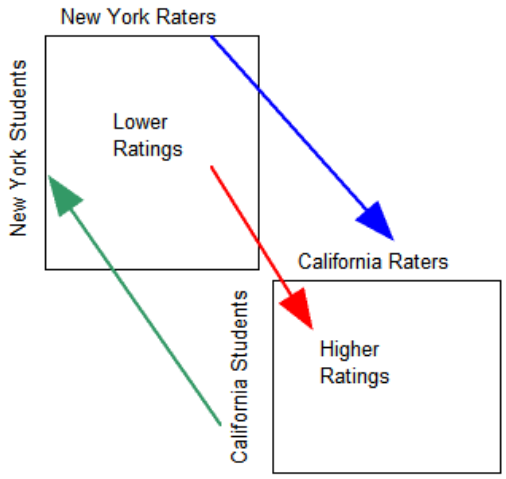
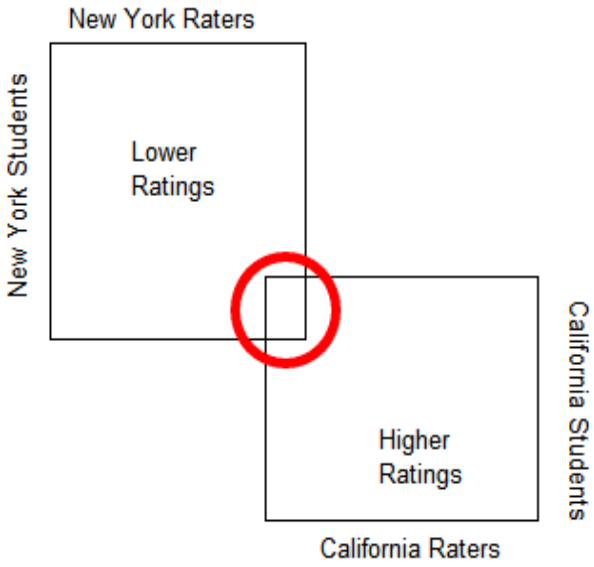
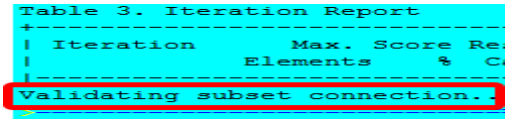
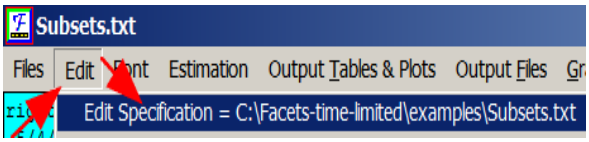
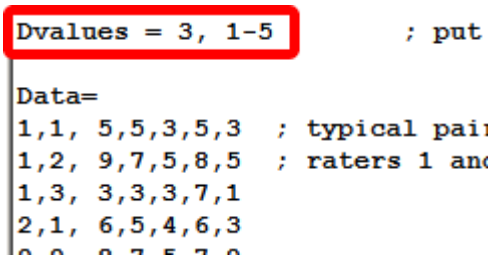
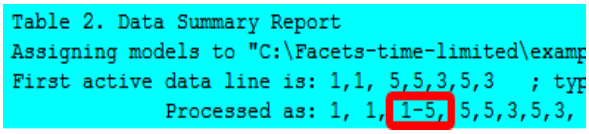
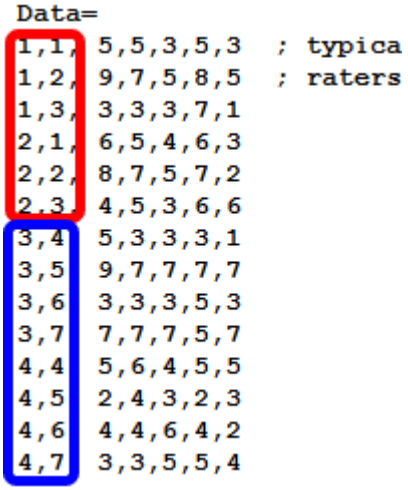
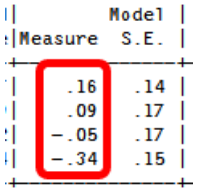
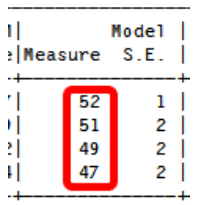
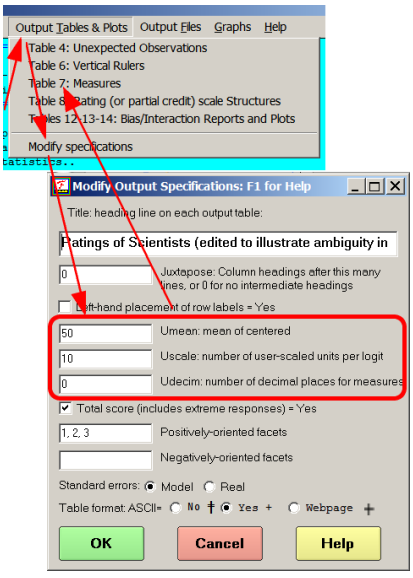
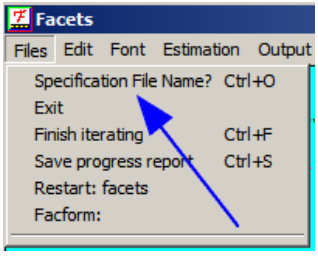
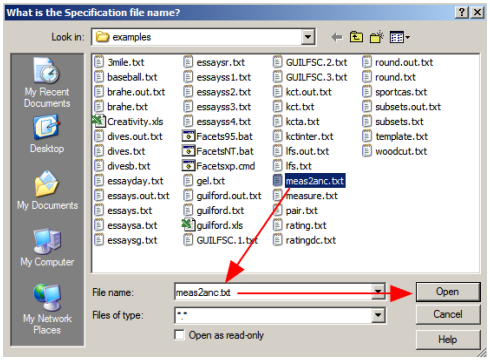
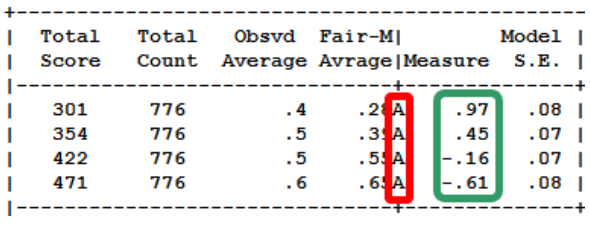
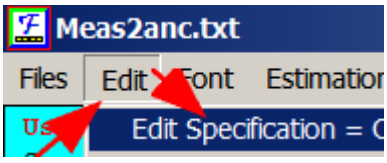
#	Many-Facet Rasch Measurement : Facets Tutorial Mike Linacre - 1/2012	
1.	**Tutorial 4. Anchoring** ***Dig here for treasure!*** • Subset detection and remedies • Anchoring, linking and equating • Judging plans and Generalizability Theory This tutorial builds on Tutorials 1, 2 and 3, so please go back and review when you need to.	
2.	**A. Subset Detection and Remedies**	
3.	Yes, launch *Facets* again	
4.	We'll start this Tutorial by looking at a situation that frequently arises when Rasch-analyzing conventional experimental designs and judging plans. Click on "Files" Click on "Specification File Name?"	
5.	"What is the Specification file name?" Click on "Subsets.txt" and "Open" or Double-Click on "Subsets.txt" "Extra Specifications" - click on "OK" "What is the Report Output file name" - click on "Open" Subsets.txt is analyzed	
6.	At the end of the analysis report in the Facets main window, do you see: **Warning (6)! There may be 2 disjoint subsets** This is a **strong warning.** The results of this analysis may be **misleading.**	

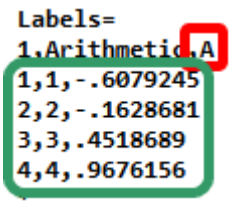
7.	What are disjoint (or disconnected or partially connected subsets)? Look at the Figure here. The New York Students were rated by the New York Raters, and the California Students were rated by the California Raters. The California Students were awarded higher ratings. *Imagine the newspaper headlines:* "California Students perform better than New York Students! California average: 3.7, New York average 3.5." Sounds convincing doesn't it!	
8.	The truth is that we don't whether the higher California ratings are because the California students perform better, or the California raters are more lenient, or a bit of both. The two sets of ratings are disconnected, disjoint. They are two separate subsets of the data. **We need to connect them up.** Perhaps fly some California raters to New York and some New York raters to California. Or have some New York students rated by California raters, or	
9.	This design reflects many judging plans. But, instead of "New York" and "California", it is usually "Rater pair A" and "Rater pair B". So perhaps I am rated by the lenient pair of judges and you are rated the severe pair. No one will ever know. The ratings themselves are treated as though they are *the truth, but they are not.* **"Conclusions about a child's [performance] would depend on the luck of the draw ... a liberal rater rather than a stringent one."** *(Shavelson & Webb, Generalizability Theory, 1991, p. 8).* A similar situation arises when there are several tasks available, and each examinee is assigned (or chooses) to perform only one. There is no evidence in the data for comparing task difficulty.	
10.	In Rasch measurement, we want all measures to be **directly comparable in one frame of reference.** So, whenever possible, we arrange for the data to be fully linked. This means the ability of every student can be compared with that of every other student either directly or indirectly. Similarly for the leniency of every rater, and the difficulty of every item, task, etc. In complex judging plans and experimental designs, it can be difficult to verify that linking has been achieved. In practice, raters fall sick, students, patients, etc. enter and leave a study. Rating sessions have to be rescheduled. Consequently, the "wrong" raters may do the rating, or a student may receive fewer ratings than was intended. So verification of connection (linkage) in the data is required.	
11.	*In the Facets analysis window, Table 3:* *Facets* performs a scan of the data to verify that all possible subsets of the data are connected.	

12.	This may take several passes through the data for complex designs, so the data scan is combined with estimation	Validating subset connection.. >========== | PROX 1 Consolidating 2 subsets >. Validating subset connection.. >========== | JMLE 2 25.6451 -20.9 - Consolidating 2 subsets
13.	Finally, either the data are determined to be fully connected (linked) or the disjoint subsets have been identified	>.< Warning (6)! There may be 2 disjoint subsets >==========
14.	On your windows task bar, Click on the "Subsets.out.txt" - the Report Output file for the analysis of Subsets.txt or *Facets* "Edit" menu: Edit Subsets.out.txt	
15.	Scroll down to Table 7.1.1 The measure report tells you which elements of each facet belong to each subset. here "subset: 1" could be thought of as "New York" and "subset: 2" could be "California". Looking at this Table usually provides clues as to what has happened. In this example, the "Judges" were the raters. Perhaps the judges paired-up to perform the ratings.	| N Judges | | 3 Cavendish | in subset: 2 | 2 Brahe | in subset: 1 | 1 Avogadro | in subset: 1 | 4 Davey | in subset: 2 We can compare measures within the same subset, but not across subsets.
16.	Scroll down to Table 7.2.1 Two subsets again! Now we know what happened: the judges paired up, and each pair of judges rated different examinees. This is exactly like the New York - California example. *But Facets has reported measures!* Yes - but those measures are somewhat accidental. *Facets* guesses at what the relationship between the subsets might be.	| N Examinees | | 2 Betty | in subset: 1 | 7 George | in subset: 2 | 5 Edward | in subset: 2 | 1 Anne | in subset: 1 | 4 David | in subset: 2 | 3 Chris | in subset: 1 | 6 Fred | in subset: 2 We can compare measures within the same subset, but not across subsets.
17.	*Practical note:* our experience is that raters must be carefully monitored during a rating session. In one instance, raters were paired to conduct oral examinations. At each break, the raters were supposed to change rating partners. But no one supervised this. So it was not until the data analysis, after rating was completed, that the Examination Board discovered that the raters had stuck with their first partner for the entire examination period. So the Examination Board had to assume that the pairs of raters were equally severe, but they had no means to verify this. It was "luck of the draw" (#9) again	
18.	*Recommendation:* **Run *Facets* analyses during the data collection.** Then problems will be identified as soon as they arise, and while they can be remedied. For instance, if we have 30 rater pairs, then after the first judging session we would expect our analysis to show 15 subsets of 1 pair each. Then, at the first break, each rater pairs with another rater. If this is done carefully, at the end of the second session all the data should be linked together. Something will probably go wrong, so maybe three or four subsets are reported. Now you can act on that information for the third session and revise the rater pairings to make sure the data are fully linked. Running *Facets* simultaneously with the data collection also has the benefit that other problems such as rater misunderstandings, data entry errors, incorrect instructions to the examinees, can be remedied ***before*** they threaten the validity of the examination process.	

19.	Let's look at the data, and see if there are any clues there: On the Facets menu bar, click on "Edit" Click on "Edit Specification"	
20.	Scroll down to the bottom of "Subsets.txt" Can you work out what **Dvalues = 3, 1-5** is specifying? *Sure you can!* This is a 3-facet analysis. In the data are the element numbers for the first two facets, "Judges" and "Examinees". Facet 3 is "Items" and they are **the same 5 items in every line.** So, instead of entering: 1,1,1-5, 5,5,3,5,3 1,2,1-5, 9,7,5,8,5 We specify **Dvalues = 3, 1-5** and the facet 3 element numbers are 1-5 on every line.	
21.	Confirm this in the Facets analysis window. It reports that the first data line is: 1,1, 5,5,3,5,3, but it is analyzed as 1, 1, 1-5, 5,5,3,5,3 *What a neat short cut!*	
22.	Now take a look at the data in **Subsets.txt** We can see clearly that facet 1, elements 1 and 2, combined with facet 2, elements 1,2 and 3. This is one subset. And facet 1, elements 3 and 4, combined with facet 2, elements 4, 5, 6 and 7. This is the second subset. *There is no mystery about this!* But what about the 5 items? They are the same 5 items in both subsets. They are linked, but they are not enough to link the subsets. We need all three facets linked for unambiguous measurement.	
23.	A word about conventional experimental designs and judging plans: 1. Fully crossed designs: These are linked (fully connected). 2. Nested designs: These are not linked (disconnected). Different "nests" are like New York and California. 3. Partially crossed designs: These may or may not be fully connected.	
24.	In a big dataset, connection-checking can take some time, so, after you have verified it once you may want not want to do it in later analyses of the same data.	*Facets* specifications: Subsets = Yes ; verify subset connection Subsets = Bypass ; don't check connection

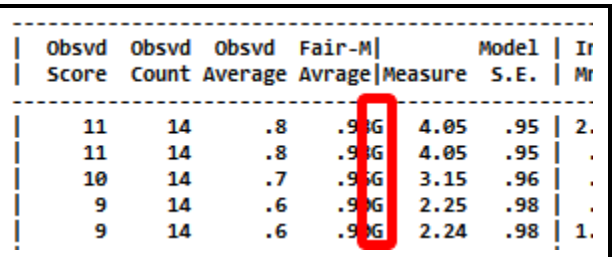
25.	**B. Connecting Data**		
26.	If *Facets* warns that the data form subsets, there are several actions you can take: 1. Ignore the subset warning. *Facets* reports an arbitrary set of measures that is consistent with the data. This one of infinitely many sets of possible measures. The measures reported by *Facets* may be good enough for your purposes if all you need are fit statistics, bias analyses, or to compare measures in the same subset. 2. Use only measures within the same subset. Sometimes one subset is very small or peripheral to your purposes. That small subset can be ignored. 3. Collect more data using elements (raters, etc.) designed to link the subsets. This is the best option. 4. Use Anchor values to identify the locations of elements in different subsets (anchoring is coming next). 5. Use Group-Anchoring to identify equivalent distributions of elements. So, if the examinees are randomly assigned to raters, it is reasonable to assert that the different subsets of examinees are equally able, on average.		
27.	**C. User Scaling**		
28.	Our reports have been in logits centered at 0. Many people have trouble understanding these, because they have negative numbers and decimals		*Umean = 0,1, 2*
29.	We can convert our output to more user-friendly integers Umean = mean values, scaling, decimals		*Umean = 50, 10, 0*
30.	You can experiment with different values using the Output Tables menu Modify Specifications Table 7 (Look at Table 7) Output Tables menu Modify Specifications Table 7 (Look at Table 7)		
31.	Close all windows ...		
32.			

33.	**D. Anchoring Element Measures**	
34.	We may perform one analysis, estimate measures, and then want to impose those measures on a subsequent analysis. This is done with **anchoring** (also called "**fixing**"). Let's take a look at a Specification file with anchor values: Launch *Facets*	
35.	Click on "Files" Click on "Specification File Name?"	
36.	Click on "Meas2anc.txt" and "Open" or Double-Click on "meas2anc.txt" "Extra Specifications" - click on "OK" "What is the Report Output file name" - click on "Open"	
37.	Scroll the Report Output file on your screen, "Meas2anc.out.txt" until you reach Table 7. It is a standard Facets measure Table. Red box: notice the "A" letters. These indicate that these measures (green box) are not estimated from the current data. They are anchored, fixed, assigned from values given in the Specification file. Let's see where they came from	
38.	On the *Facets* menu bar, click on "Edit" Click on "Edit Specification ..."	

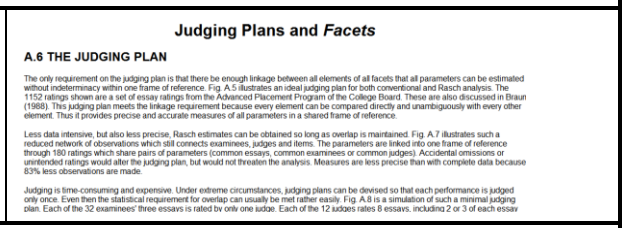
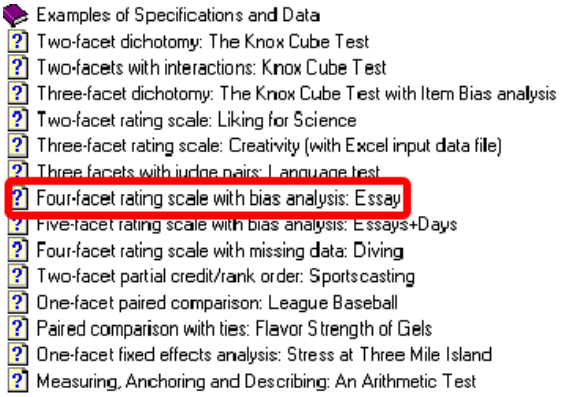
39.	Scroll down the Specification file to *Labels=* The first facet is Arithmetic: Red box: 1, Arithmetic, A 1 is Facet 1 1, or 1= mean the same in most Facets specifications Arithmetic is the facet label ,A means "the values that are given are anchor values" Green box: The first element: 1, is the element number 1, is the element label - it is the same as the element number, so we could have omitted it -.6079245 is the value at which to anchor the element measure. We don't this many decimal places - two decimal places is easily enough!	 Notice that these values do not sum to zero. These values came from another analysis and we want to make the measures in this analysis directly comparable with those in that other analysis (whatever it was).
40.	The second facet says it is anchored, A but there are no anchor values for the elements, so the anchor instruction, "A" is ignored.	2,Race, A 1,Black ; no values, A ignored 2,White 3,Asian 4.Hispanic *
41.	Now we can see how dummy facets work: When elements are anchored at 0, they contribute nothing to the combined measures that are modeled to produce the observations. When you anchor elements, be sure that **at least one facet is unanchored and non-centered**, or the analysis will be over-constrained, and will not estimate correctly.	; Dummy facet 2,Race, A 1,Black, 0 2,White,0 3,Asian,0 4.Hispanic,0 *
42.	Here's a near short-cut when several elements are to have the same anchor value. You can specify the element numbers twice and *Facets* will accumulate the element details	; Dummy facet 2,Race, A 1,Black 2,White 3,Asian 4,Hispanic 1-4, ,0 ; the anchor value *
43.	And, if all the elements are to be anchored at 0, we can use anchor-code D.	; Dummy facet 2,Race, D 1,Black 2,White 3,Asian 4,Hispanic *

44.	You may have noticed this in the dives.txt data. The elements have measures, but there is no letter after the facet label: 2, facet label 1, element label, measure When a measure is given without an anchor letter, the measure is used as a starting value for the estimation procedure. This can speed up estimation. It was important when computers were slower. We rarely use this now. Starting values are usually set at the final values of a previous analysis. You can obtain these values by "Output Files" menu "Anchor Output File". When these values are used, the estimation process starts from these estimates rather than from the beginning.	2,Dives 1,1.4, -0.60 ;starting values 2,1.7, -0.98 3,1.8, 0.35 4,2.2, -0.16 5,2.3, -0.51 6,2.4, 0.44 7,2.5, 0.46 8,2.6, 0.99 9,2.4? ; unclear what dive this was *

45.	E. Group Anchoring	
46.	There is usually only one way to resolve disjoint (connected) subsets that are discovered after data collection has finished: "group anchoring". Here we assert that one *group* of element measures has the same average as another *group* of element measures. In the New York & California example, we could say: The California raters are as equally severe (on average) as the New York raters, or we could say "The California students are as equally able (on average) as the New York students." The fit of the data to the Rasch model is the same for both statements. Bias analyses are the same for both statements. The data can't tell us which is correct. If in doubt, we could try the analysis both ways and see which report makes the most sense to communicate. In this example, probably "the two sets of raters are equally severe, on average".	
47.	When we want to specify that two groups of raters have the same average severity, we use Group Anchoring. Let's **Group anchor** two sets of raters: Here we have two groups, "1" (California) and "2" (New York). And we want the average severity of both groups to be "50" (the Umean= user-scaling value, see #29). So we specify "50" as the measure value for each rater. We give each rater a group number "1" or "2". And we specify group anchoring "G". In our output, the average severity of raters 1, 3, 4, .. will be 50. The average severity of raters 2, 5, .. will also be 50. We use this when the two groups of raters have rated different people, so that the rater groups are disconnected.	subsets.txt contains **Umean = 50, 10** We have specified that the "zero" value for our measures is 50. 1, Raters, G 1, George, 50, 1 2, Mary, 50, 2 3, Fred, 50, 1 4, Harry, 50, 1 5, Anne, 50, 2 ..... Group-anchoring "centers" a facet, so be sure that **another facet is non-centered.**
48.	**Anchoring raters between analyses:** Raters tend to drift (change their leniencies) between rating sessions. So it is often not practical to anchor individual raters at their previous measures. But in a group of raters, some will become more lenient and some will become more severe, so it may be practical to group-anchor their average leniency. When equating groups of raters across years, each rater contribute his/her previous measure to the group average..	; Group 1 are old raters with measures ; ungrouped raters are new raters. ; The average severity of the old raters will be maintained .... 1, Raters, G 1, George, 2.37, 1 ; 2.37 is previous severity 2, Mary 3, Fred, 1.58, 1 4, Harry, 0.36, 1 5, Anne .....

49.	Here is what the output of a Group Anchor analysis looks like. I used the Kct.txt data The letter "G" is to remind us that the reported measures have been group-anchored to a group average.	
50.		

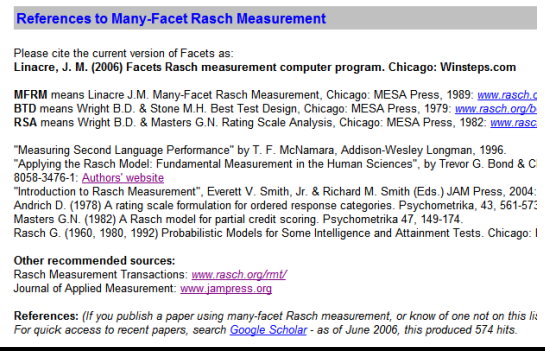
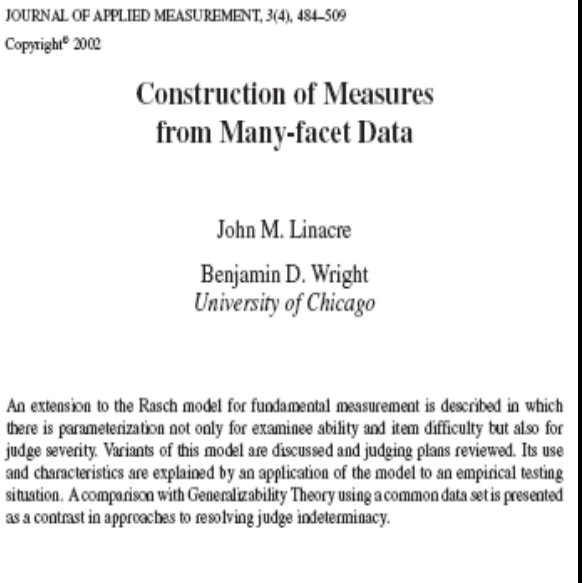
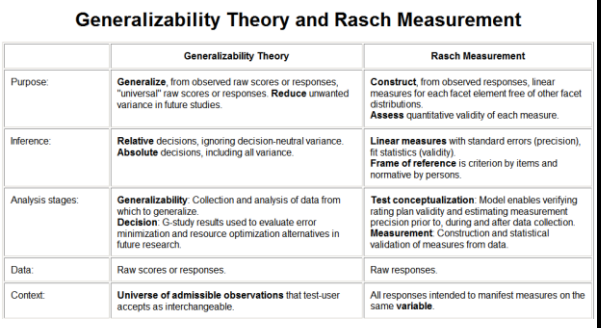
Obsvd Score	Obsvd Count	Obsvd Average	Fair-M Avrage	Measure	Model S.E.	In Mn
11	14	.8	.9G	4.05	.95	2.
11	14	.8	.9G	4.05	.95	.
10	14	.7	.9G	3.15	.96	.
9	14	.6	.9G	2.25	.98	.
9	14	.6	.9G	2.24	.98	1.

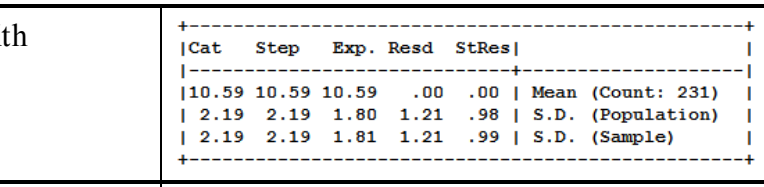
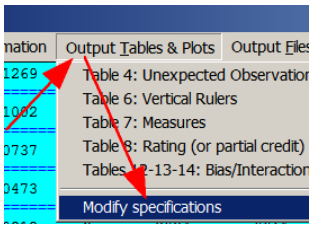
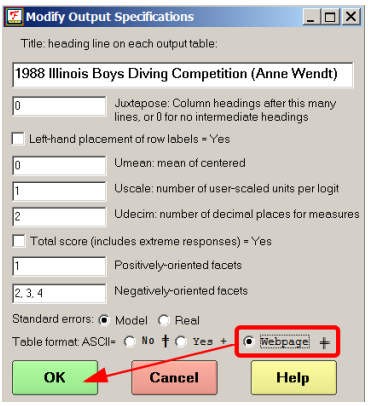
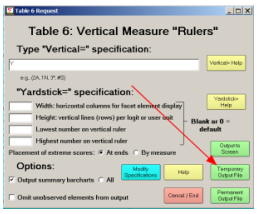
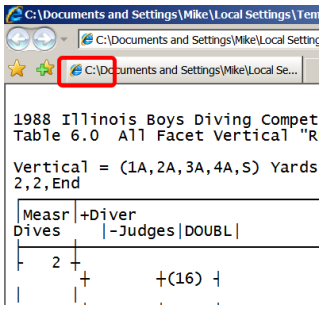
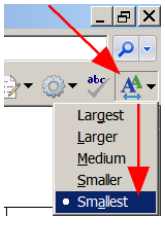
51.	**F. Experimental Design and Judging Plans**	
52.	Judging plans. You've got the crucial concept ... There has to be linkage. We need to be able to place every element measure unambiguously in one frame of reference. For stable estimates, we need at least 30 observations of every element, and at least 10 observations in every rating scale category. But we can obtain useful measures with much less.	
53.	For judging plans, the chief aspects are summarized at http://www.rasch.org/rn3.htm which is also in Facets Help	 **Judging Plans and *Facets*** **A.6 THE JUDGING PLAN** The only requirement on the judging plan is that there be enough linkage between all elements of all facets that all parameters can be estimated without indeterminacy within one frame of reference. Fig. A.5 illustrates an ideal judging plan for both conventional and Rasch analysis. The 1152 ratings shown are a set of essay ratings from the Advanced Placement Program of the College Board. These are also discussed in Braun (1988). This judging plan meets the linkage requirement because every element can be compared directly and unambiguously with every other element. Thus it provides precise and accurate measures of all parameters in a shared frame of reference. Less data intensive, but also less precise, Rasch estimates can be obtained so long as overlap is maintained. Fig. A.7 illustrates such a reduced network of observations which still connects examinees, judges and items. The parameters are linked into one frame of reference through 180 ratings which share pairs of parameters (common essays, common examinees or common judges). Accidental omissions or unintended ratings would alter the judging plan, but would not threaten the analysis. Measures are less precise than with complete data because 83% less observations are made. Judging is time-consuming and expensive. Under extreme circumstances, judging plans can be devised so that each performance is judged only once. Even then the statistical requirement for overlap can usually be met rather easily. Fig. A.8 is a simulation of such a minimal judging plan. Each of the 32 examinees' three essays is rated by only one judge. Each of the 12 judges rates 8 essays, including 2 or 3 of each essay
54.	**G. The Partial Credit Model**	
55.	There are many other *Models*= options. Some are shown in the Facets example files. They are described in the Help file. Look again at the **Essay test** in the Help file. It corresponds to "**Essays.txt**" in the Facets Examples. Each essay is rated by twelve Readers (raters, judges). Let's look more closely at the behavior of the Readers.	 Examples of Specifications and Data Two-facet dichotomy: The Knox Cube Test Two-facets with interactions: Knox Cube Test Three-facet dichotomy: The Knox Cube Test with Item Bias analysis Two-facet rating scale: Liking for Science Three-facet rating scale: Creativity (with Excel input data file) Three facets with judge pairs: Language test Four-facet rating scale with bias analysis: Essay Five-facet rating scale with bias analysis: Essays+Days Four-facet rating scale with missing data: Diving Two-facet partial credit/rank order: Sportscasting One-facet paired comparison: League Baseball Paired comparison with ties: Flavor Strength of Gels One-facet fixed effects analysis: Stress at Three Mile Island Measuring, Anchoring and Describing: An Arithmetic Test
56.	A useful model for exploring rater behavior is the "**Partial Credit**" model. This models each rater (or item or person or ...) to define their own rating scale. We model this using the "#" sign for the rater facet.	$\log_e(P_{nij} / P_{ni(j-1)}) = B_n - D_i - F_{ij}$ *(This was in Tutorial 1)*

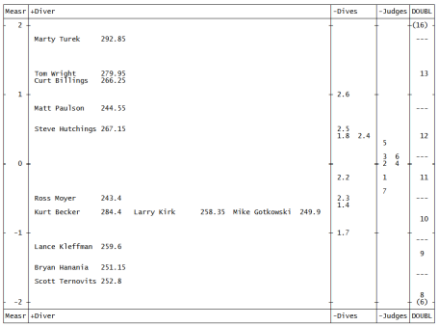
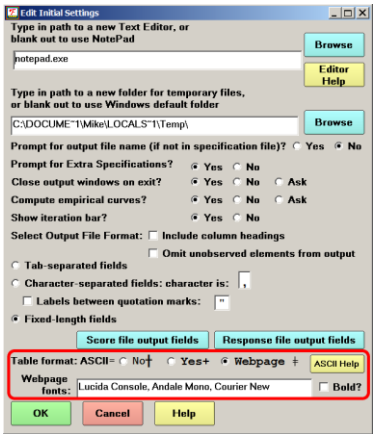
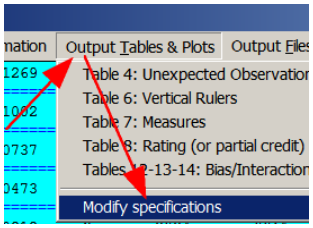
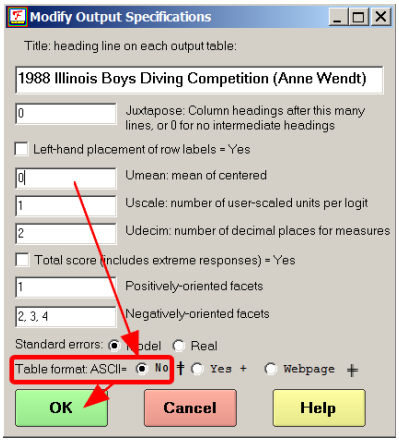
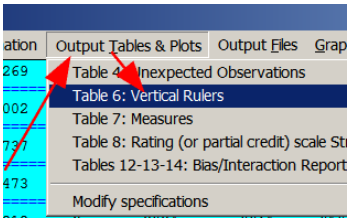
57.	Here are the original model specifications in Essays.txt
	All the ratings match the first model statement.
	The second model statement is to instruct Facets to perform two bias-interaction analyses.
		`Model =`
		`?,?B,?B,?,R9`
		`?,?,?B,?B,R9`
		`*`

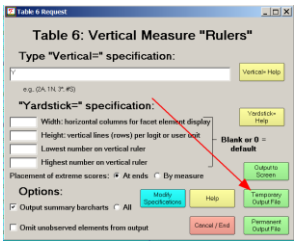
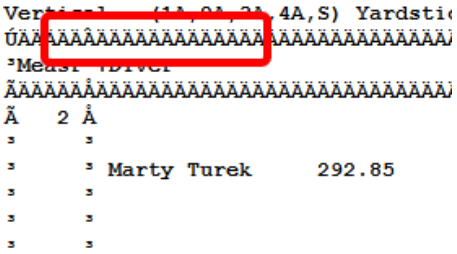
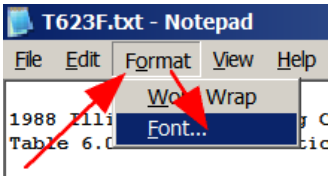
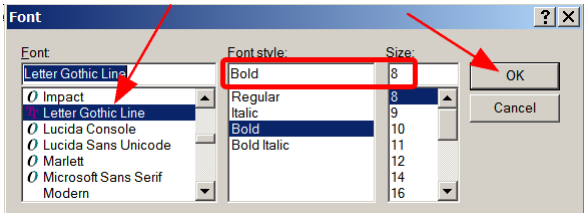
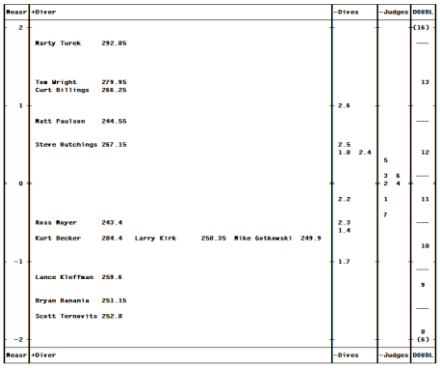
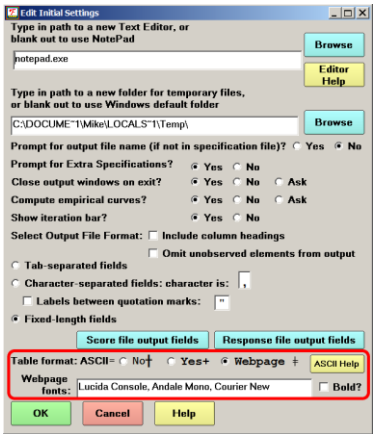
58.	But what if some Readers are using the rating scale in a way that differs from the other Readers?
	We can investigate this by applying the "partial credit' model to the Readers. Readers are facet 3.
		`Model =`
		`?,?B,#B,?,R9 ; # in facet 3`
		`?,?,?B,?B,R9`
		`*`

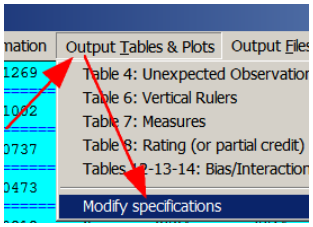
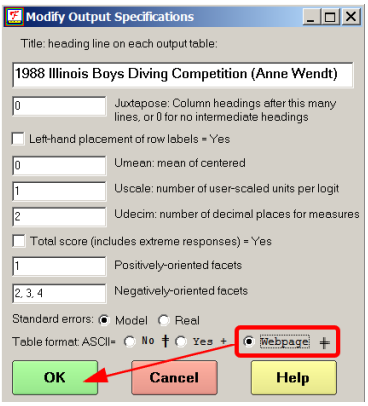
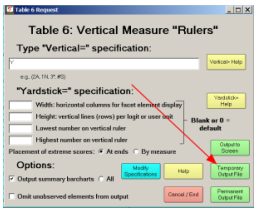
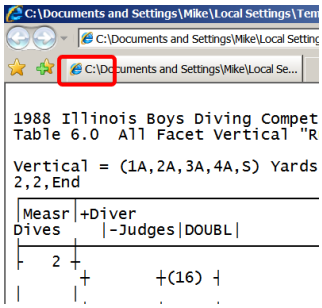
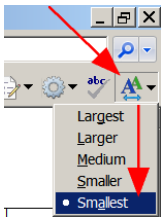
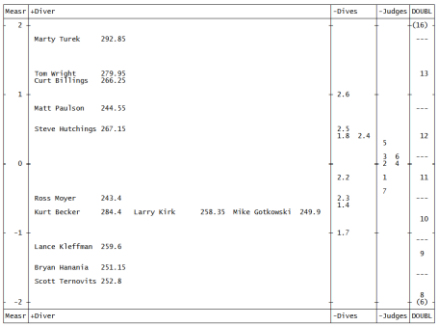
59.		
60.		

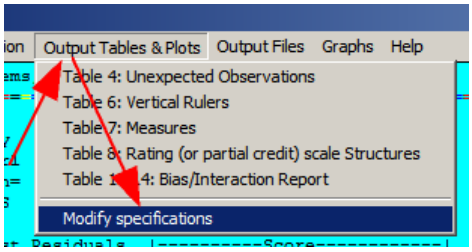
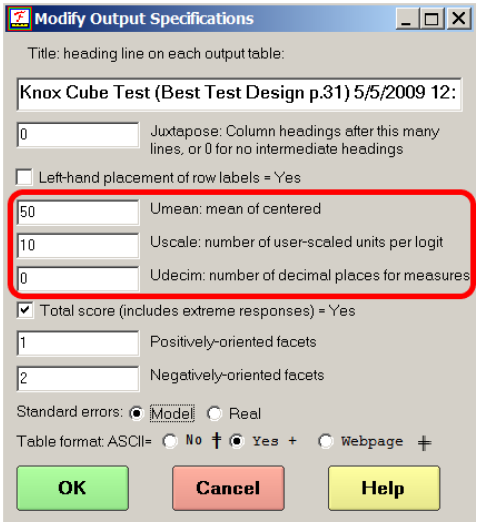
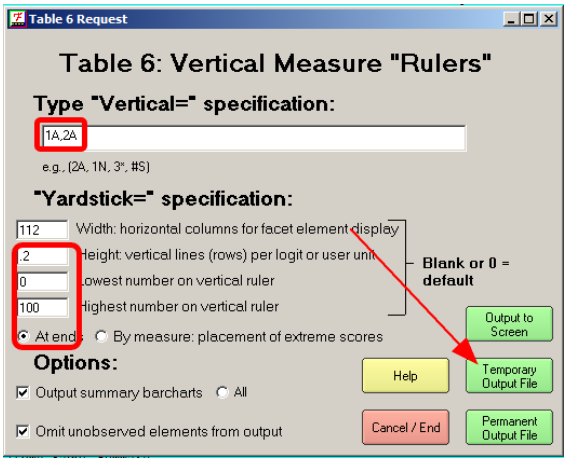
61.	**Optional**	
62.	Tell the world about your Facets analyses! There are over 200 published papers using MFRM. See Facets Help or http://www.winsteps.com/facetman/references.htm You may find that one of these is a useful model for your work. Please let me know. If you know of any other Facets papers, please tell me.	 **References to Many-Facet Rasch Measurement** Please cite the current version of Facets as: **Linacre, J. M. (2006) Facets Rasch measurement computer program. Chicago: Winsteps.com** **MFRM** means Linacre J.M. Many-Facet Rasch Measurement, Chicago: MESA Press, 1989: www.rasch.c **BTD** means Wright B.D. & Stone M.H. Best Test Design, Chicago: MESA Press, 1979: www.rasch.org/b **RSA** means Wright B.D. & Masters G.N. Rating Scale Analysis, Chicago: MESA Press, 1982: www.rasc "Measuring Second Language Performance" by T. F. McNamara, Addison-Wesley Longman, 1996. "Applying the Rasch Model: Fundamental Measurement in the Human Sciences", by Trevor G. Bond & C 8058-3476-1: Authors' website "Introduction to Rasch Measurement", Everett V. Smith, Jr. & Richard M. Smith (Eds.) JAM Press, 2004: Andrich D. (1978) A rating scale formulation for ordered response categories. Psychometrika, 43, 561-573 Masters G.N. (1982) A Rasch model for partial credit scoring. Psychometrika 47, 149-174. Rasch G. (1960, 1980, 1992) Probabilistic Models for Some Intelligence and Attainment Tests. Chicago: I **Other recommended sources:** Rasch Measurement Transactions: www.rasch.org/rmt/ Journal of Applied Measurement: www.jampress.org **References:** *(If you publish a paper using many-facet Rasch measurement, or know of one not on this li* *For quick access to recent papers, search Google Scholar - as of June 2006, this produced 574 hits.*
63.	Read the Paper at construction.pdf This Paper will give you 1. a review of what we have covered during the Course 2. a look at some judging plans. A minimal-effort judging plan is mentioned. This was part of the reason this methodology was developed. The first application of many-facet Rasch measurement was for the American Society of Clinical Pathologists and their certifying examination for medical technicians. 3. a comparison of many-facet Rasch measurement and Generalizability Theory (G-Theory). These are sometimes thought to be solving the same problem. The focus of G-Theory is to decompose the variance in a set of observed ratings into its component parts. In contrast, the focus of MFRM is to estimate the set of measures underlying the observed ratings.	 JOURNAL OF APPLIED MEASUREMENT, 3(4), 484–509 Copyright© 2002 **Construction of Measures from Many-facet Data** John M. Linacre Benjamin D. Wright *University of Chicago* An extension to the Rasch model for fundamental measurement is described in which there is parameterization not only for examinee ability and item difficulty but also for judge severity. Variants of this model are discussed and judging plans reviewed. Its use and characteristics are explained by an application of the model to an empirical testing situation. A comparison with Generalizability Theory using a common data set is presented as a contrast in approaches to resolving judge indeterminacy.
64.	For more about many-facet Rasch measurement MFRM vs. Generalizability Theory, please see my comparison at http://www.rasch.org/rmt/rmt151s.htm MFRM is an extension of Georg Rasch's measurement theory. Generalizability Theory is an extension of Lee J. Cronbach's reliability theory.	 **Generalizability Theory and Rasch Measurement** | | Generalizability Theory | Rasch Measurement | | Purpose: | **Generalize**, from observed raw scores or responses, "universal" raw scores or responses. **Reduce** unwanted variance in future studies. | **Construct**, from observed responses, linear measures for each facet element free of other facet distributions. **Assess** quantitative validity of each measure. | | Inference: | **Relative** decisions, ignoring decision-neutral variance. **Absolute** decisions, including all variance. | **Linear measures** with standard errors (precision), fit statistics (validity). **Frame of reference** is criterion by items and normative by persons. | | Analysis stages: | **Generalizability**: Collection and analysis of data from which to generalize. **Decision**: G-study results used to evaluate error minimization and resource optimization alternatives in future research. | **Test conceptualization**: Model enables verifying rating plan validity and estimating measurement precision prior to, during and after data collection. **Measurement**: Construction and statistical validation of measures from data. | | Data: | Raw scores or responses. | Raw responses. | | Context: | **Universe of admissible observations** that test-user accepts as interchangeable. | All responses intended to manifest measures on the same **variable**. |

#	Appendix 1. Prettying Facets Output	
65.	Usually, Facets output tables are displayed with "Courier New" font	
66.	Facets has two more options: **1. Webpage** In the *Facets Analysis* window, Click on "Output Tables & Plots" Click on "Modify specifications"	
67.	Click on "ASCII = Webpage" Click on "OK" ASCII = Webpage can also be entered into your Facets Specifications	
68.	Click on "Temporary Output File"	
69.	Table 6 displays as a webpage in Internet Explorer (or your Internet browser). It may not look right. The webpage size may need reducing using:	
70.	In your browser, reduce the font size	

71.	The Table displays beautifully as a webpage. Again, of publication-quality. The best font for this display is Lucida Console. Andale Mono and Courier New are good substitutes. Consolas does not display correctly.	
72.	If you want to make the ASCII= permanent, then in the Facets Analysis window, Click on "Edit" Click on "Edit Initial Settings" Click on the ASCII= option Click OK	
73.	**2. Letter Gothic Line** This may not work in your version of Windows Click on "Output Tables & Plots" Click on "Modify specifications"	
74.	Click on ASCII= No Click OK You can also specify ASCII= No in your Facets specification file	
75.	Click on "Output Tables & Plots" Click on "Table 6: Vertical Rulers" (or any other output table)	

76.	Click on “Temporary Output File”	
77.	The output file displays, but it looks wrong! This is because it is displayed with “Courier New” but we need “Letter Gothic Line”	
78.	In the NotePad window, Click on Format Click on Font	
79.	Under Font, Scroll to “Letter Gothic Line” and click on it Change the “Font Style” and “Size” to make your output look pretty Click on “OK”	
80.	Notice how the box now look neat - much more “publication quality”.	
81.	If you want to make the ASCII= permanent, then in the Facets Analysis window, Click on “Edit” Click on “Edit Initial Settings” Click on the ASCII= option Click OK	

82.	Facets has another option: 2. Webpage In the *Facets Analysis* window, Click on "Output Tables & Plots" Click on "Modify specifications"	
83.	Click on "ASCII = Webpage" Click on "OK" ASCII = Webpage can also be entered into your Facets Specifications	
84.	Click on "Temporary Output File"	
85.	Table 6 displays as a webpage in Internet Explorer (or your Internet browser). It may not look right. The webpage size may need reducing using:	
86.	In your browser, reduce the font size	
87.	The Table displays beautifully as a webpage. Again, of publication-quality. The best font for this display is Lucida Console. Andale Mono and Courier New are good substitutes. Consolas does not display correctly.	

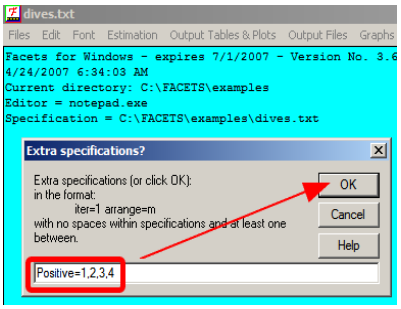
88.	**Appendix 2. Table 6: Customizing the Vertical Rulers**	
89.	Communication is often the most challenging part of measurement so .... Use the Facets "Output Tables & Plots" menu to produce a "map" of the children's performance on the items	*Table 6, the vertical "rulers" is the place to start.*
90.	Look at your map, does it contain positive and negative numbers? Perhaps even decimals? These are lousy for communication to a non-technical audience. So rescale the logits into more user-friendly numbers - then produce your map.	
91.	Click on the Facets menu bar Click on "Output Table & Plots" Click on "Modify specifications"	
92.	**User-scaling of logits (see also #29):** Negative numbers and decimals are awkward to understand and communicate to others. We like positive integers whenever possible. You can linearly rescale the logit values into positive integers. It is like going from Fahrenheit to Celsius. You can change the zero point, and the scaling factor, but the meaning of the measures does not change. Start with: mean 50, 10 units per logit, 0 decimal places *Umean*=50, 10, 0 then experiment to get an even nicer range of numbers on your map.	
93.	Here's an idea to get you started .... Below is something like what you may have now, but feel free to improve on this ... You can beautify your map (in Word or whatever).	

94.

```
|Measr|+Children                                                    |-Tapping items                  |
+ 100 +                                                            + 4-1-3-4-2-1-4  1-3-2-4-1-3     +
:     :                                                            : 1-4-2-3-1-4    1-4-3-1-2-4     :
+  95 +                                                            +                                +
+  90 +                                                            +                                +
+  85 + G Elsie      G Maggie                                      + 1-4-2-3-4-1                    +
+  80 + B Brian                                                    +                                +
+  75 +                                                            +                                +
+  70 + B Agustin    B Kazuo      B Wolf       G Doris             + 1-3-2-4-3      1-4-3-2-4       +
+  65 +                                                            +                                +
+  60 + B Boris      B Fangzhuo   B Salih      G Christine  G Marge + 1-3-1-2-4                      +
+  55 +                                                            +                                +
+  50 + B Edward     B Harry      B Jose       B Trevor     B Xerxes +                                +
:     : G Amanda     G Casey      G Dawn       G Hilda      G Sylvia :                                :
:     : G Tracey     G Yvonne                                      :                                :
+  45 +                                                            +                                +
+  40 +                                                            +                                +
+  35 + G Anne       G Ethne      G Leslie                         + 2-4-3-1                        +
+  30 + B Vladimir   G Catherine                                   +                                +
+  25 +                                                            + 1-4-2-3                        +
+  20 + B George     G Donna                                       +                                +
+  15 + B Enrico     G Denise                                      + 1-3-2-4        3-4-1           +
+  10 +                                                            + 1-4-3-2        2-1-4           +
+   5 + B Luiz                                                     + 1-3-4                          +
*   0 * B Eduardo                                                 * 1-2-4          1-4             *
:     :                                                            : 2-3                            :
|Measr|+Children                                                    |-Tapping items                  |
```

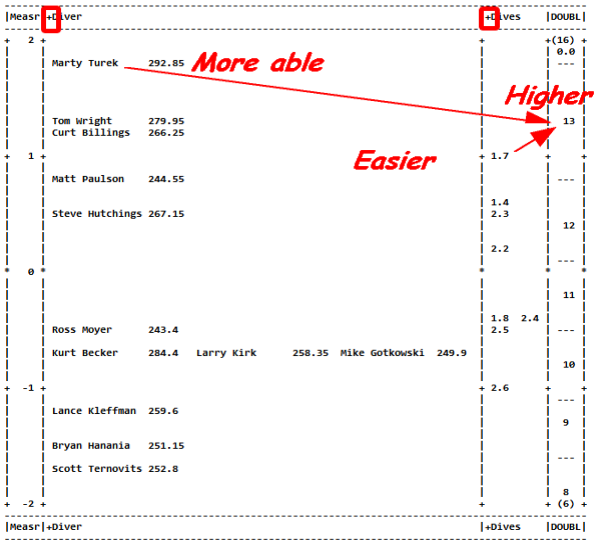
95. Each ":" on the "ruler" map indicates that this is a continuation line. The elements on this line have the same measure as those on the previous line.

96. If you want to align your measures with the rating scale on the right of Table 6, then align all facets positively.
Positive=1,2,3,4
or
Negative=0
This is often preferred in medical rehabilitation research.
You can do this from the "Extra Specifications" prompt if you don't want to change your specification file



97. Table 6 for "Dives.txt"

Notice how the more able diver scores higher on the rating scale
The easier dive is high on the rating scale because it is more likely to be given a high rating.



98. Close all windows ...