

# Annex **A4**

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## WORD-COUNT AND THE 3 Cs – ANALYSIS OF VARIANCE

This annex provides technical details for the analysis of variance performed for the language demand section of Chapter 5.

In all cases a full factorial ANOVA was performed in SPSS using a univariate GLM procedure. The dependent variable in all cases was defined as item difficulty in logits centered at 0 for each country. The two factors in all cases were the same: country and categorized word count (see Chapter 5 for the detailed description of word-count). In the first case no other factors were added (see Table 5.1), in the subsequent cases one of the 3Cs were added (Tables 5.2 through Table 5.5) as a third factor (context, competency and content in the form of traditional topics). The third factor was added to find whether there are interactions between the word-count and features discussed in Chapter 5. Please note that as in Chapter 5, the content is categorized by traditional topics such as Algebra, Data, Geometry, Measurement, and Number.

In addition to the F statistics, that show significance of main effects and interactions, partial  $\eta^2$  is also provided to assess for the percent of total variance in the dependent variable accounted for by the variance between categories (groups) formed by the independent variable(s).



Table A4.1  
Full factorial ANOVA with word-count and country as factors

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial $\eta^2$
Word-count	547.805	2	273.902	191.563	0.000	0.105
Country	0.302	39	0.008	0.005	1.000	0.000
Country * Word-count	16.334	78	0.209	0.146	1.000	0.003
Error	4 689.842	3 280	1.430			
Total	5 253.982	3 400				

Table A4.2  
Full factorial ANOVA with word-count, country and competencies as factors

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial $\eta^2$
Word-count	168.611	2	84.306	80.109	0.000	0.048
Country	0.772	39	0.020	0.019	1.000	0.000
Competency	1 003.119	2	501.560	476.596	0.000	0.230
Competency * Word-count	77.286	4	19.322	18.360	0.000	0.022
Country * Word-count	15.620	78	0.200	0.190	1.000	0.005
Country * Competency	10.138	78	0.130	0.124	1.000	0.003
Error	3 363.403	3 196	1.052			
Total	5 253.982	3 400				

Table A4.3  
Full factorial ANOVA with word-count, country and content as factors

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial $\eta^2$
Word-count	111.663	2	55.832	49.443	0.000	0.031
Country	5.689	39	0.146	0.129	1.000	0.002
Content	650.356	4	162.589	143.983	0.000	0.156
Content * Word-count	353.445	7	50.492	44.714	0.000	0.091
Country * Word-count	13.851	78	0.178	0.157	1.000	0.004
Content* Country	60.126	156	0.385	0.341	1.000	0.017
Error	3 515.263	3 113	1.129			
Total	5 253.982	3 400				

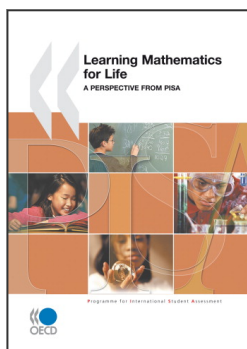


Table A4.4  
Full factorial ANOVA with word-count, country and context as factors

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial $\eta^2$
Word-count	569.862	2	284.931	208.467	0.000	0.117
Country	0.471	39	0.012	0.009	1.000	0.000
Context	167.604	3	55.868	40.875	0.000	0.037
Context * Word-count	183.411	6	30.568	22.365	0.000	0.041
Country * Word-count	12.781	78	0.164	0.120	1.000	0.003
Context * Country	20.949	117	0.179	0.131	1.000	0.005
Error	4 310.861	3 154	1.367			
Total	5 253.982	3 400				

Table A4.5  
Post hoc comparisons for word-count mean difficulties using Bonferroni adjustment

Word Count (I)	Word Count (J)	Mean Difference (I-J)	Std. Error	Sig.	99% Confidence Interval	
					Lower Bound	Upper Bound
<b>Short</b>	Medium	0.00828	0.052187	1.000	-0.14502	0.16157
	Long	-0.84144	0.054174	0.000	-1.00057	-0.68231
<b>Medium</b>	Short	-0.00828	0.052187	1.000	-0.16157	0.14502
	Long	-0.84972	0.047475	0.000	-0.98917	-0.71026
<b>Long</b>	Short	0.84144	0.054174	0.000	0.68231	1.00057
	Medium	0.84972	0.047475	0.000	0.71026	0.98917



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