APPENDIX

Appendix D: School principal questionnaire in TIMSS (Martin, Mullis, Gonzalez & Chrostowski, 2004)

Question Number	Item Content	Description	Number of items	Analysis
1	Grade levels	Grade range of the school	2	
2	Enrolment	Total school enrolment in all grades and in the target grade	2	
3	Community size	Size of the community in which the school is located	1	
4	Absenteeism	Percentage of students absent from school on a typical school day	1	
5	Stability/ mobility of student body	Percentage of students enrolled at the beginning of the school year who were still enrolled at the time of testing, and percentage of students who enrolled after the beginning of the school year	2	
6	Students' background	Percentage of students who come from economically disadvantaged or affluent homes, and percentage of students whose native language is the language of the test	A(2), B(1)	
7	School climate	Principal's perception of teachers' job satisfaction and expectations for student achievement; of parental support and involvement; and of students' regard for school property and desire to do well in school	8	FA
8	Principal's experience	Number of years as a principal of this school	1	
9	Principal's time allocation	Percentage of time principal spends on various activities across the school year	6	
10	Parental involvement	Whether the school expects parents to participate in various activities	5	
11	Instructional time	Number of days per year and days per week the school is open for instruction, and number of hours of instructional time in a typical day	4	
12	Differentiation of mathematics curriculum	How the school organizes mathematics instruction for students with different levels of ability	1	
13	Tracking in mathematics	Whether the students are grouped by ability in their mathematics classes	1	
14	Enrichment/ remedial mathematics	Whether the school offers enrichment and remedial courses in mathematics	2	
15	Differentiation of science curriculum	How the school organizes science instruction for students with different levels of ability	1	
16	Tracking in science	Whether the students are grouped by ability in their science Classes	1	
17	Enrichment/ remedial science	Whether the school offers enrichment and remedial courses in science	2	
18	Teacher vacancies	Difficulty in filling teacher vacancies in mathematics, science, and computer science/information technology	3	
19	Incentives for	Whether the school uses incentives to	3	

	teachers	recruit or retain teachers in mathematics, science, and/or other subjects		
20	Professional development	Frequency with which teachers participated in various types of professional development activities during the school year	5	FA
21	Teacher evaluation	Whether the school uses various procedures in evaluating mathematics and science teachers	A(4), B(4)	
22	Student behaviour	Frequency and severity of various problematic student behaviours occurring in the school	A(13), B(13)	FA
23	Instructional resources	Degree to which the school's capacity to provide instruction is affected by shortages or inadequacy of various resources	20	FA
24	Computers	Number of computers available for educational purposes, and proportion of computers with access to the Internet	2	
25	Technology support	Whether there is anyone available to help teachers use information and communication technology for teaching and learning, and description of that person	2	

Source. Martin et al. (2000)
NA. non applicable due to mathematics-related items
FA. factor analysis
RA. reliability analysis

Appendix E: Factor analysis of the Korean data

Student questionnaire

Liking science

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.868
Bartlett's Test of Sphericity	Approx. Chi-Square	14545.083
	Df	21
	Sig.	.000

Communalities

	Initial	Extraction
do well in science	1.000	.670
take more science	1.000	.470
enjoy learning science	1.000	.586
learn science quickly	1.000	.602
science is more difficult	1.000	.555
not understand a new topic	1.000	.357
science is not strengths	1.000	.623

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.864	55.202	55.202	3.864	55.202	55.202
2	.967	13.821	69.023			
3	.589	8.412	77.435			
4	.495	7.066	84.502			
5	.421	6.012	90.513			
6	.336	4.799	95.312			
7	.328	4.688	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
do well in science	.819
take more science	.686
enjoy learning science	.766
learn science quickly	.776
science is more difficult	.745
not understand a new topic	.597
science is not strengths	.789

Extraction Method: Principal Component Analysis.
[a]. 1 components extracted.

Valuing science

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.757
Bartlett's Test of Sphericity	Approx. Chi-Square	8949.398
	df	10
	Sig.	.000

Communalities

	Initial	Extraction
for daily life	1.000	.467
for other subjects	1.000	.523
for university	1.000	.658
for science job	1.000	.547
for job I want	1.000	.671

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.867	57.331	57.331	2.867	57.331	57.331
2	.913	18.261	75.592			
3	.528	10.568	86.160			
4	.413	8.261	94.421			
5	.279	5.579	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
for daily life	.684
for other subjects	.723
for university	.811
for science job	.740
for job I want	.819

Extraction Method: Principal Component Analysis.

[a]. 1 components extracted.

Leaning activities in science

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.854
Bartlett's Test of Sphericity	Approx. Chi-Square	18646.543
	df	91
	Sig.	.000

Communalities

	Initial	Extraction
listen to lecture stu	1.000	.659
work problem stu	1.000	.547
watch demonstration stu	1.000	.364
formulate hypothesis stu	1.000	.505
design experiment stu	1.000	.598
conduct experiment stu	1.000	.668
work in small group stu	1.000	.678
write explanation stu	1.000	.639
technology on society stu	1.000	.492
relate to daily life stu	1.000	.514
present work stu	1.000	.485
review homework stu	1.000	.428
have quiz	1.000	.234
begin homework	1.000	.368

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.519	32.282	32.282	4.519	32.282	32.282	3.077	21.982	21.982
2	1.397	9.980	42.262	1.397	9.980	42.262	2.642	18.874	40.855
3	1.261	9.007	51.269	1.261	9.007	51.269	1.458	10.413	51.269
4	.994	7.101	58.370						
5	.836	5.974	64.344						
6	.817	5.839	70.183						
7	.760	5.429	75.612						
8	.690	4.931	80.543						
9	.544	3.884	84.427						
10	.522	3.728	88.155						
11	.512	3.658	91.813						
12	.488	3.486	95.299						
13	.350	2.498	97.797						
14	.308	2.203	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component		
	1	2	3
listen to lecture stu	.107	.247	.766
work problem stu	.110	.437	.587
watch demonstration stu	.576	.178	-.011
formulate hypothesis stu	.514	.468	-.149
design experiment stu	.657	.397	-.089
conduct experiment stu	.792	.199	.026
work in small group stu	.783	-.007	.255
write explanation stu	.736	.119	.288
technology on society stu	.175	.679	.006
relate to daily life stu	.088	.687	.185
present work stu	.401	.569	-.005
review homework stu	.147	.569	.287
have quiz	.148	.458	.042
begin homework	.003	.371	-.479

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
[a]. Rotation converged in 5 iterations.

Component Transformation Matrix

Component	1	2	3
1	.734	.640	.226
2	-.658	.588	.471
3	-.168	.494	-.853

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

School climate

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.729
Bartlett's Test of Sphericity	Approx. Chi-Square	3366.058
	df	6
	Sig.	.000

Communalities

	Initial	Extraction
like being in school	1.000	.478
stu do the best	1.000	.534
tch care about stu	1.000	.630
tch want stu to do best	1.000	.481

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.123	53.073	53.073	2.123	53.073	53.073
2	.751	18.764	71.837			
3	.615	15.386	87.223			
4	.511	12.777	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
like being in school	.691
stu do the best	.731
tch care about stu	.794
tch want stu to do best	.694

Extraction Method: Principal Component Analysis.

[a]. 1 components extracted.

Out-of-school activities

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.664
Bartlett's Test of Sphericity	Approx. Chi-Square	4228.751
	df	36
	Sig.	.000

Communalities

	Initial	Extraction
work paid job	1.000	.687
do jobs at home	1.000	.499
play sports	1.000	.445
read book for enjoy	1.000	.442
do homework	1.000	.599
watch tv or video	1.000	.498
play computer game	1.000	.570
play with friend	1.000	.343
use internet	1.000	.573

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.126	23.620	23.620	2.126	23.620	23.620	1.993	22.140	22.140
2	1.504	16.708	40.328	1.504	16.708	40.328	1.449	16.102	38.242
3	1.027	11.410	51.738	1.027	11.410	51.738	1.215	13.496	51.738
4	.892	9.915	61.652						
5	.842	9.351	71.003						
6	.756	8.402	79.405						
7	.733	8.142	87.547						
8	.642	7.137	94.685						
9	.478	5.315	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component		
	1	2	3
work paid job	-.012	-.066	.826
do jobs at home	.362	.556	.242
play sports	.144	.283	.587
read book for enjoy	-.129	.613	.224
do homework	-.028	.759	-.147
watch tv or video	.705	.019	-.038
play computer game	.673	-.259	.225
play with friend	.555	.187	-.005
use internet	.753	-.039	.071

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 4 iterations.

Component Transformation Matrix

Component	1	2	3
1	.916	.186	.357
2	-.306	.898	.317
3	-.261	-.399	.879

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Computers

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.626
Bartlett's Test of Sphericity	Approx. Chi-Square	3286.214
	df	3
	Sig.	.000

Communalities

	Initial	Extraction
look up ideas for science	1.000	.481
write reports	1.000	.693
analyze data	1.000	.748

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.922	64.060	64.060	1.922	64.060	64.060
2	.699	23.295	87.355			
3	.379	12.645	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
look up ideas for science	.694
write reports	.832
analyze data	.865

Extraction Method: Principal Component Analysis.

[a]. 1 components extracted.

Science teacher questionnaire

Preparation to teach

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.894
Bartlett's Test of Sphericity	Approx. Chi-Square	2366.434
	df	210
	Sig.	.000

Communalities

	Initial	Extraction
ready for biology a	1.000	.786
ready for biology b	1.000	.744
ready for biology c	1.000	.777
ready for biology d	1.000	.717
ready for biology e	1.000	.662
ready for chemistry a	1.000	.883
ready for chemistry b	1.000	.809
ready for chemistry c	1.000	.854
ready for chemistry d	1.000	.761
ready for chemistry e	1.000	.824
ready for physics a	1.000	.818
ready for physics b	1.000	.830
ready for physics c	1.000	.674
ready for physics d	1.000	.757
ready for physics e	1.000	.818
ready for earth science a	1.000	.884
ready for earth science b	1.000	.894
ready for earth science c	1.000	.699
ready for environment a	1.000	.778
ready for environment b	1.000	.879
ready for environment c	1.000	.854

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.555	45.502	45.502	9.555	45.502	45.502	4.241	20.195	20.195
2	3.352	15.960	61.462	3.352	15.960	61.462	3.932	18.724	38.920
3	1.488	7.085	68.548	1.488	7.085	68.548	3.331	15.862	54.782
4	1.229	5.853	74.400	1.229	5.853	74.400	3.036	14.459	69.240
5	1.074	5.116	79.517	1.074	5.116	79.517	2.158	10.276	79.517
6	.605	2.879	82.396						
7	.592	2.817	85.212						
8	.436	2.074	87.287						
9	.364	1.735	89.021						
10	.347	1.651	90.672						
11	.279	1.330	92.002						
12	.257	1.225	93.227						
13	.239	1.140	94.368						
14	.212	1.010	95.378						
15	.200	.953	96.331						
16	.187	.889	97.220						
17	.155	.737	97.957						
18	.129	.616	98.573						
19	.114	.542	99.115						
20	.101	.482	99.597						
21	.085	.403	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
ready for biology a	.109	-.051	.847	.231	.029
ready for biology b	.168	.075	.831	.022	.141
ready for biology c	.099	.157	.811	.275	.092
ready for biology d	.190	.126	.662	.472	.055
ready for biology e	.003	.202	.629	.473	.037
ready for chemistry a	.861	.338	.124	.044	.104
ready for chemistry b	.785	.405	.090	.106	.096
ready for chemistry c	.842	.231	.154	.195	.172
ready for chemistry d	.782	.115	.123	.256	.234
ready for chemistry e	.808	.361	.128	.041	.149
ready for physics a	.339	.817	.147	.039	.111
ready for physics b	.329	.830	.048	.114	.132
ready for physics c	.081	.731	.010	.329	.156
ready for physics d	.402	.706	.117	.003	.288
ready for physics e	.359	.787	.132	.075	.217
ready for earth science a	.254	.248	.080	.105	.861
ready for earth science b	.170	.246	.116	.256	.852
ready for earth science c	.376	.441	.216	.191	.529
ready for environment a	.154	.090	.270	.810	.128
ready for environment b	.163	.143	.302	.841	.184
ready for environment c	.132	.122	.259	.858	.135

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 6 iterations.

Component Transformation Matrix

Component	1	2	3	4	5
1	.562	.530	.382	.380	.336
2	-.369	-.399	.639	.538	-.089
3	-.614	.360	-.373	.366	.469
4	-.404	.609	.441	-.403	-.332
5	-.091	-.244	.336	-.519	.741

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Teacher interaction

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.526
Bartlett's Test of Sphericity	Approx. Chi-Square	90.622
	df	6
	Sig.	.000

Communalities

	Initial	Extraction
interact pedagogy	1.000	.767
interact materials	1.000	.790
interact by visiting	1.000	.757
interact by observing	1.000	.740

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.753	43.831	43.831	1.753	43.831	43.831	1.542	38.555	38.555
2	1.301	32.529	76.360	1.301	32.529	76.360	1.512	37.805	76.360
3	.501	12.535	88.896						
4	.444	11.104	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component	
	1	2
interact pedagogy	.855	.191
interact materials	.887	-.052
interact by visiting	-.024	.870
interact by observing	.153	.846

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 3 iterations.

Component Transformation Matrix

Component	1	2
1	.730	.683
2	-.683	.730

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Attitudes toward science subject

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.625
Bartlett's Test of Sphericity	Approx. Chi-Square	113.699
	df	36
	Sig.	.000

Communalities

	Initial	Extraction
more than 1 representation	1.000	.611
solving by hypothesis	1.000	.605
learning by memorizing	1.000	.577
scientific investigation	1.000	.513
getting correct answer	1.000	.482
scientific theories	1.000	.325
skill and knowledge	1.000	.632
modelling phenomena	1.000	.494
scientific discoveries	1.000	.472

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.917	21.303	21.303	1.917	21.303	21.303	1.909	21.208	21.208
2	1.666	18.517	39.820	1.666	18.517	39.820	1.537	17.079	38.287
3	1.127	12.527	52.347	1.127	12.527	52.347	1.265	14.060	52.347
4	.899	9.990	62.337						
5	.857	9.523	71.860						
6	.810	8.999	80.858						
7	.625	6.946	87.804						
8	.562	6.242	94.046						
9	.536	5.954	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component		
	1	2	3
more than 1 representation	.654	.045	.425
solving by hypothesis	.775	.033	-.052
learning by memorizing	.052	.254	.714
scientific investigation	.673	.121	-.212
getting correct answer	-.090	.677	-.128
scientific theories	.541	-.172	-.057
skill and knowledge	-.180	.712	.304
modelling phenomena	.240	.660	.025
scientific discoveries	-.183	-.156	.644

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
[a]. Rotation converged in 5 iterations.

Component Transformation Matrix

Component	1	2	3
1	.992	.117	-.040
2	-.081	.860	.504
3	.094	-.496	.863

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

School setting

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.676
Bartlett's Test of Sphericity	Approx. Chi-Square	71.905
	df	6
	Sig.	.000

Communalities

	Initial	Extraction
school facility repair	1.000	.385
safe neighbourhood	1.000	.525
feel safe at school	1.000	.656
security policy of school	1.000	.380

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.946	48.650	48.650	1.946	48.650	48.650
2	.808	20.191	68.841			
3	.752	18.796	87.637			
4	.495	12.363	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
school facility repair	.620
safe neighbourhood	.725
feel safe at school	.810
security policy of school	.616

Extraction Method: Principal Component Analysis.

[a]. 1 components extracted.

School climate

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.774
Bartlett's Test of Sphericity	Approx. Chi-Square	451.453
	df	28
	Sig.	.000

Communalities

	Initial	Extraction
teacher job satisfaction	1.000	.535
Teacher understanding curriculum	1.000	.708
teacher success in curriculum	1.000	.691
teacher expectation for student	1.000	.543
parent support for student	1.000	.750
parent involvement in school	1.000	.725
student regard for school	1.000	.552
student desire to do well	1.000	.666

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.702	46.281	46.281	3.702	46.281	46.281	3.094	38.674	38.674
2	1.468	18.348	64.629	1.468	18.348	64.629	2.076	25.955	64.629
3	.669	8.364	72.993						
4	.653	8.161	81.154						
5	.593	7.413	88.567						
6	.402	5.027	93.594						
7	.341	4.260	97.853						
8	.172	2.147	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component	
	1	2
teacher job satisfaction	.463	.424
teacher success in curr	.352	.745
Teacher understanding curriculum	.569	.607
teacher expectation for student	.702	.012
parent support for student	.795	-.292
parent involvement in school	.773	-.316
student regard for school	.710	-.149
student desire to do well	.692	-.332

Extraction Method: Principal Component Analysis.

[a]. 2 components extracted.

Rotated Component Matrix[a]

	Component	
	1	2
teacher job satisfaction	.207	.702
teacher understanding curriculum	.194	.819
teacher success in curriculum	.047	.830
teacher expectation for student	.635	.374
parent support for student	.856	.133
parent involvement in school	.840	.140
student regard for school	.712	.213
student desire to do well	.815	.038

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 3 iterations.

Component Transformation Matrix

Component	1	2
1	.853	.522
2	-.522	.853

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Content-related activities

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.769
Bartlett's Test of Sphericity	Approx. Chi-Square	515.303
	df	55
	Sig.	.000

Communalities

	Initial	Extraction
watch demonstration	1.000	.498
formulate hypotheses	1.000	.721
design experiment	1.000	.602
conduct experiment	1.000	.722
work in small group	1.000	.757
write explanation	1.000	.576
put event in order	1.000	.551
technology on society	1.000	.540
learn nature and inquiry	1.000	.753
present work	1.000	.456
relate to daily life	1.000	.549

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.069	36.988	36.988	4.069	36.988	36.988	2.463	22.395	22.395
2	1.649	14.989	51.977	1.649	14.989	51.977	2.217	20.153	42.548
3	1.006	9.148	61.125	1.006	9.148	61.125	2.043	18.576	61.125
4	.932	8.476	69.600						
5	.741	6.732	76.333						
6	.720	6.541	82.874						
7	.556	5.056	87.930						
8	.460	4.180	92.110						
9	.353	3.210	95.320						
10	.283	2.570	97.891						
11	.232	2.109	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component		
	1	2	3
watch demonstration	-.004	.209	.674
formulate hypotheses	.382	-.142	.745
design experiment	.228	.409	.618
conduct experiment	-.046	.611	.589
work in small group	-.082	.758	.419
write explanation	.313	.686	.081
put event in order	.579	.416	.205
technology on society	.727	.090	-.056
learn nature and inquiry	.817	.167	.239
relate to daily life	.661	.038	.135
present work	.436	.596	-.053

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 14 iterations.

Component Transformation Matrix

Component	1	2	3
1	.582	.606	.542
2	.809	-.363	-.462
3	.084	-.708	.702

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Rotated Component Matrix[a]

	Component		
	1	2	3
limit in academic difference	.662	.049	.224
limit in background	.557	.164	.089
limit in special need	.550	.189	-.150
limit in uninterest	.881	.006	.121
limit in low morale	.855	.046	.086
limit disruptive student	.799	.093	.131
limit in hardware	-.002	.054	.877
limit in software	.169	.217	.749
limit in using computer	.128	.246	.780
limit in textbook	-.104	.667	-.020
limit in other equipment	.206	.815	.188
limit in equipment	.221	.773	.260
limit in physical facility	.224	.611	.283
limit in stu/tch ratio	.347	.299	.299

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 4 iterations.

Component Transformation Matrix

Component	1	2	3
1	.728	.490	.480
2	-.686	.508	.521
3	-.012	.708	-.706

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Topic coverage

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.836
Bartlett's Test of Sphericity	Approx. Chi-Square	5644.273
	df	946
	Sig.	.000

Communalities

	Initial	Extraction		Initial	Extraction
OTL biology a	1.000	.608	OTL biology b	1.000	.640
OTL biology f	1.000	.482	OTL biology c	1.000	.584
OTL biology g	1.000	.654	OTL biology d	1.000	.698
OTL biology h	1.000	.670	OTL biology e	1.000	.784
OTL biology i	1.000	.726	OTL chemistry a	1.000	.649
OTL biology j	1.000	.585	OTL chemistry b	1.000	.675
OTL biology k	1.000	.672	OTL physics a	1.000	.589
OTL biology l	1.000	.652	OTL physics b	1.000	.668
OTL chemistry c	1.000	.576	OTL physics d	1.000	.683
OTL chemistry d	1.000	.532	OTL physics e	1.000	.788
OTL chemistry e	1.000	.599	OTL physics f	1.000	.686
OTL chemistry f	1.000	.625	OTL physics g	1.000	.729
OTL chemistry g	1.000	.736	OTL physics i	1.000	.558
OTL chemistry h	1.000	.611	OTL physics j	1.000	.473
OTL physics c	1.000	.566	OTL earth science a	1.000	.827
OTL physics h	1.000	.411	OTL earth science b	1.000	.690
OTL earth science d	1.000	.647	OTL earth science c	1.000	.714
OTL earth science f	1.000	.495	OTL earth science e	1.000	.737
OTL earth science i	1.000	.614	OTL earth science g	1.000	.679
OTL environment a	1.000	.802	OTL earth science h	1.000	.542
OTL environment b	1.000	.814	OTL earth science j	1.000	.687
OTL environment c	1.000	.725	OTL earth science k	1.000	.696

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.075	20.624	20.624	9.075	20.624	20.624	4.338	9.860	9.860
2	4.925	11.194	31.818	4.925	11.194	31.818	4.329	9.838	19.698
3	3.215	7.307	39.125	3.215	7.307	39.125	4.056	9.219	28.917
4	2.502	5.687	44.812	2.502	5.687	44.812	2.896	6.582	35.499
5	2.068	4.701	49.513	2.068	4.701	49.513	2.705	6.147	41.646
6	1.735	3.942	53.455	1.735	3.942	53.455	2.663	6.051	47.697
7	1.406	3.196	56.651	1.406	3.196	56.651	2.429	5.520	53.217
8	1.373	3.120	59.772	1.373	3.120	59.772	1.742	3.959	57.176
9	1.208	2.745	62.517	1.208	2.745	62.517	1.741	3.956	61.132
10	1.070	2.432	64.948	1.070	2.432	64.948	1.679	3.816	64.948
11	.927	2.107	67.055						
12	.874	1.986	69.041						
13	.810	1.842	70.883						

OTL chemistry d	.486	.243	-.234	.028	.214	-.122	.052	.060	.336	-.040
OTL chemistry e	.444	.379	-.365	-.057	.214	.209	.073	-.122	.079	.074
OTL chemistry f	.494	.283	-.393	-.235	.229	.174	.011	-.056	-.009	-.075
OTL chemistry g	.514	.319	-.347	-.114	.312	.297	.079	-.128	.053	.161
OTL chemistry h	.421	.218	-.213	-.058	.264	.261	.207	.240	-.107	.295
OTL physics c	.563	.164	-.082	-.114	.008	.095	-.189	-.174	-.335	-.118
OTL physics h	.411	.219	-.274	.045	.198	.203	.143	.081	.091	.044
OTL earth science d	.518	.153	-.169	-.351	-.046	-.085	-.269	-.323	.107	-.082
OTL earth science f	.492	.258	-.187	-.224	-.024	.065	-.079	-.244	.118	.129
OTL earth science i	.437	.117	-.157	.033	-.398	.449	-.010	.023	-.147	-.038
OTL environment a	.395	.541	-.043	.077	-.339	-.301	.341	-.094	.029	.120
OTL environment b	.383	.473	-.029	.109	-.431	-.266	.380	-.115	.025	.124
OTL environment c	.338	.469	-.048	.120	-.286	-.247	.481	-.027	-.007	-.007
OTL biology b	.303	.009	.615	.006	.214	.176	.191	-.167	.143	-.092
OTL biology c	.273	-.001	.573	.248	-.063	.240	.005	-.178	.156	.040
OTL biology d	.346	.050	.696	-.034	.125	.147	.014	-.210	.073	.061
OTL biology e	.286	.059	.658	.275	.116	.258	.037	-.276	.157	.092
OTL chemistry a	.426	-.479	-.297	.303	.081	-.205	.034	-.060	-.066	-.022
OTL chemistry b	.454	-.461	-.260	.364	.140	-.148	.004	-.121	.024	.015
OTL physics a	.494	-.267	.035	.093	.115	-.161	.193	-.112	-.291	-.300
OTL physics b	.572	-.472	-.115	.248	.097	-.123	-.038	-.080	-.100	-.014
OTL physics d	.588	-.187	.036	-.137	.014	.081	.064	-.046	-.421	-.303
OTL physics e	.522	-.446	.173	-.421	.077	-.135	.104	.201	.057	.175
OTL physics f	.496	-.399	.151	-.339	.115	.011	.157	.193	-.015	.259
OTL physics g	.450	-.481	-.271	.390	.130	-.142	.033	-.081	.128	.092
OTL physics i	.383	-.382	-.129	.366	.271	-.107	-.011	-.151	-.047	.071
OTL physics j	.503	-.311	.073	.198	.033	.038	.190	-.033	-.127	-.150
OTL earth science a	.603	-.345	.175	-.448	-.120	-.243	-.007	.134	.019	.147
OTL earth science b	.633	-.150	.099	-.410	-.221	.036	-.041	-.093	-.083	-.149
OTL earth science c	.679	-.198	.185	-.361	-.186	-.021	-.080	.012	.028	-.081
OTL earth science e	.588	-.366	.237	-.336	-.117	-.160	-.041	.168	.081	.106
OTL earth science g	.514	-.387	-.061	.278	-.215	-.058	-.253	-.010	.247	.099
OTL earth science h	.369	-.288	-.049	.237	-.207	.044	-.234	.307	.262	.047
OTL earth science j	.370	-.162	-.146	.180	-.491	.457	.020	.128	.042	.031
OTL earth science k	.337	-.253	-.087	.315	-.484	.409	.002	.070	.000	-.069

Extraction Method: Principal Component Analysis.

[a]. 10 components extracted.

Rotated Component Matrix[a]

	Component									
	1	2	3	4	5	6	7	8	9	10
OTL biology a	.062	-.058	.176	.253	.046	.107	-.036	.681	.131	.105
OTL biology f	.028	.098	.208	.170	.328	.230	-.086	.475	.079	.015
OTL biology g	.005	.135	.199	.252	.668	.015	-.149	-.230	.101	.035
OTL biology h	-.011	-.112	.158	.072	.746	.127	.113	.132	.156	.007

Type of homework

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.597
Bartlett's Test of Sphericity	Approx. Chi-Square	94.208
	df	21
	Sig.	.000

Communalities

	Initial	Extraction
homework on problem	1.000	.630
homework on application	1.000	.618
homework on textbook	1.000	.574
homework on definition	1.000	.607
homework on project	1.000	.782
homework on investigation	1.000	.712
homework on report	1.000	.405

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.977	28.238	28.238	1.977	28.238	28.238	1.718	24.536	24.536
2	1.312	18.739	46.977	1.312	18.739	46.977	1.547	22.105	46.641
3	1.040	14.858	61.835	1.040	14.858	61.835	1.064	15.194	61.835
4	.830	11.858	73.693						
5	.765	10.930	84.623						
6	.587	8.382	93.005						
7	.490	6.995	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component		
	1	2	3
homework on problem	.781	-.139	.025
homework on application	.528	.298	-.501
homework on textbook	.729	.091	.184
homework on definition	.468	.595	-.182
homework on project	.196	.219	.834
homework on investigation	-.182	.824	.012
homework on report	.076	.591	.222

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 7 iterations.

Component Transformation Matrix

Component	1	2	3
1	.787	.616	.039
2	-.599	.748	.285
3	.147	-.248	.958

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Use of homework

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.534
Bartlett's Test of Sphericity	Approx. Chi-Square	46.521
	df	10
	Sig.	.000

Communalities

	Initial	Extraction
homework monitor	1.000	.587
homework feedback	1.000	.534
homework correct	1.000	.696
homework discussion	1.000	.233
homework grade	1.000	.732

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.608	32.164	32.164	1.608	32.164	32.164	1.606	32.115	32.115
2	1.174	23.487	55.651	1.174	23.487	55.651	1.177	23.535	55.651
3	.984	19.683	75.333						
4	.640	12.802	88.136						
5	.593	11.864	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component	
	1	2
homework monitor	.757	-.121
homework feedback	.714	.158
homework correct	.429	-.715
homework discussion	.483	-.008
homework grade	.326	.791

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 3 iterations.

Component Transformation Matrix

Component	1	2
1	.997	-.075
2	.075	.997

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

School principal questionnaire

School climate

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.852
Bartlett's Test of Sphericity	Approx. Chi-Square	633.309
	df	28
	Sig.	.000

Communalities

	Initial	Extraction
teacher job satisfaction-p	1.000	.483
teacher understand goals	1.000	.597
teacher degree of success	1.000	.653
teacher expect student	1.000	.658
parent support student	1.000	.589
parent involve school	1.000	.574
student regard school	1.000	.499
student desire do well	1.000	.649

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.701	58.764	58.764	4.701	58.764	58.764
2	.970	12.130	70.894			
3	.762	9.525	80.418			
4	.455	5.689	86.108			
5	.354	4.428	90.535			
6	.319	3.987	94.523			
7	.271	3.388	97.910			
8	.167	2.090	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
teacher job satisfaction-p	.695
teacher understand goals	.773
teacher degree of success	.808
teacher expect student	.811
parent support student	.768
parent involve school	.758
student regard school	.706
student desire do well	.805

Extraction Method: Principal Component Analysis.

[a]. 1 components extracted.

Professional development

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.719
Bartlett's Test of Sphericity	Approx. Chi-Square	143.690
	df	10
	Sig.	.000

Communalities

	Initial	Extraction
develop curriculum	1.000	.490
develop school goal	1.000	.257
develop content knowledge	1.000	.660
develop teaching skill	1.000	.576
develop ICT	1.000	.402

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.385	47.695	47.695	2.385	47.695	47.695
2	.973	19.457	67.153			
3	.660	13.206	80.359			
4	.634	12.679	93.037			
5	.348	6.963	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
develop curriculum	.700
develop school goal	.507
develop content knowledge	.812
develop teaching skill	.759
develop ICT	.634

Extraction Method: Principal Component Analysis.

[a]. 1 components extracted.

Student behaviour (frequencies)

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.858
Bartlett's Test of Sphericity	Approx. Chi-Square	590.925
	df	78
	Sig.	.000

Communalities

	Initial	Extraction
frequency of late arrival	1.000	.761
frequency of absenteeism	1.000	.552
frequency of skipping	1.000	.535
frequency of dress code	1.000	.635
frequency of disturbance	1.000	.582
frequency of profanity	1.000	.609
frequency of vandalism	1.000	.579
frequency of theft	1.000	.548
frequency of intimidating student	1.000	.675
frequency of injury to student	1.000	.572
frequency of cheating	1.000	.420
frequency of intimidating teacher	1.000	.602
frequency of injury to teacher	1.000	.494

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.872	37.474	37.474	4.872	37.474	37.474	3.137	24.134	24.134
2	1.565	12.039	49.513	1.565	12.039	49.513	2.900	22.311	46.445
3	1.124	8.649	58.161	1.124	8.649	58.161	1.523	11.716	58.161
4	.855	6.576	64.738						
5	.783	6.025	70.762						
6	.647	4.977	75.740						
7	.628	4.832	80.572						
8	.588	4.524	85.096						
9	.525	4.040	89.136						
10	.450	3.459	92.595						
11	.347	2.667	95.262						
12	.338	2.602	97.864						
13	.278	2.136	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component		
	1	2	3
frequency of late arrival	.849	.162	-.122
frequency of absenteeism	.667	.272	-.181
frequency of skipping	.661	.141	.280
frequency of dress code	.764	.221	.041
frequency of disturbance	.695	.310	.050
frequency of profanity	.184	.757	.041
frequency of vandalism	.223	.726	-.042
frequency of theft	.250	.665	.208
frequency of intimidating student	.183	.799	.053
frequency of injury to student	.308	.588	.362
frequency of cheating	.420	.274	.410
frequency of intimidating teacher	.054	.177	.753
frequency of injury to teacher	-.120	-.043	.691

Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 5 iterations.

Component Transformation Matrix

Component	1	2	3
1	.709	.678	.192
2	-.539	.345	.769
3	.455	-.649	.610

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Student behaviour (severity)

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.914
Bartlett's Test of Sphericity	Approx. Chi-Square	1116.074
	df	78
	Sig.	.000

Communalities

	Initial	Extraction
severity of late arrival	1.000	.629
severity of absenteeism	1.000	.472
severity of skipping	1.000	.599
severity of dress code	1.000	.581
severity of disturbance	1.000	.673
severity of cheating	1.000	.628
severity of profanity	1.000	.632
severity of vandalism	1.000	.636
severity of theft	1.000	.652
severity of intimidating student	1.000	.701
severity of injury to student	1.000	.688
severity of intimidating teacher	1.000	.817
severity of injury to teacher	1.000	.790

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.950	53.461	53.461	6.950	53.461	53.461	5.425	41.731	41.731
2	1.550	11.920	65.380	1.550	11.920	65.380	3.074	23.649	65.380
3	.843	6.484	71.864						
4	.700	5.388	77.252						
5	.527	4.053	81.305						
6	.400	3.077	84.382						
7	.383	2.943	87.326						
8	.362	2.783	90.108						
9	.322	2.474	92.583						
10	.291	2.238	94.821						
11	.288	2.213	97.034						
12	.206	1.583	98.617						
13	.180	1.383	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component	
	1	2
severity of late arrival	.760	.229
severity of absenteeism	.667	.162
severity of skipping	.767	.106
severity of dress code	.762	-.012
severity of disturbance	.807	.144
severity of cheating	.493	.621
severity of profanity	.695	.386
severity of vandalism	.710	.364
severity of theft	.633	.501
severity of intimidating student	.719	.428
severity of injury to student	.633	.536
severity of intimidating teacher	.180	.886
severity of injury to teacher	.004	.889

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 3 iterations.

Component Transformation Matrix

Component	1	2
1	.847	.531
2	-.531	.847

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Instructional resources

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.865
Bartlett's Test of Sphericity	Approx. Chi-Square	1569.906
	df	171
	Sig.	.000

Communalities

	Initial	Extraction
shortage of building and ground	1.000	.679
shortage of heat/cool and light	1.000	.652
shortage of space	1.000	.666
shortage for handicapped	1.000	.362
shortage of computer for math	1.000	.639
shortage of software for math	1.000	.634
shortage of calculator for math	1.000	.758
shortage of library for math	1.000	.648
shortage of AV for math	1.000	.599
shortage of lab equipment	1.000	.652
shortage of computer for science	1.000	.804
shortage of software for science	1.000	.822
shortage of calculator for science	1.000	.551
shortage of library for science	1.000	.719
shortage of AV for science	1.000	.775
shortage of teacher	1.000	.727
shortage of computer staff	1.000	.576
shortage of material	1.000	.704
shortage of budget	1.000	.716

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.875	41.447	41.447	7.875	41.447	41.447	4.287	22.564	22.564
2	1.884	9.914	51.361	1.884	9.914	51.361	4.056	21.348	43.912
3	1.697	8.931	60.292	1.697	8.931	60.292	2.223	11.698	55.610
4	1.228	6.463	66.756	1.228	6.463	66.756	2.118	11.146	66.756
5	.976	5.136	71.892						
6	.744	3.916	75.808						
7	.699	3.679	79.488						
8	.662	3.484	82.972						
9	.489	2.572	85.543						
10	.468	2.461	88.004						
11	.415	2.182	90.186						
12	.358	1.887	92.073						
13	.321	1.689	93.762						
14	.285	1.498	95.261						
15	.261	1.373	96.633						
16	.214	1.126	97.760						

17	.181	.951	98.710						
18	.150	.787	99.497						
19	.095	.503	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component			
	1	2	3	4
shortage of building and ground	.053	.163	.746	.305
shortage of heat/cool and light	.222	.133	.754	.128
shortage of space	.155	.193	.768	.121
shortage for handicapped	.107	.558	.189	-.062
shortage of computer for math	.298	.697	.246	-.066
shortage of software for math	.208	.701	.315	-.011
shortage of calculator for math	.002	.825	.044	.275
shortage of library for math	.336	.668	.054	.294
shortage of AV for math	.468	.578	.186	.111
shortage of lab equipment	.758	.130	.244	.034
shortage of computer for science	.787	.380	.144	-.141
shortage of software for science	.783	.442	.100	-.063
shortage of calculator for science	.230	.658	.002	.254
shortage of library for science	.602	.532	-.015	.270
shortage of AV for science	.785	.299	.176	.194
shortage of teacher	.685	-.011	.031	.507
shortage of computer staff	.626	.084	.113	.406
shortage of material	.191	.111	.229	.776
shortage of budget	.016	.207	.292	.766

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 7 iterations.

Component Transformation Matrix

Component	1	2	3	4
1	.645	.619	.334	.299
2	-.403	-.221	.618	.638
3	-.634	.725	.103	-.249
4	.141	-.206	.705	-.664

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Appendix F: Factor analysis of the South African data

Student questionnaire

Liking science

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.701
Bartlett's Test of Sphericity	Approx. Chi-Square	6811.325
	df	21
	Sig.	.000

Communalities

	Initial	Extraction
do well in science	1.000	.554
take more science	1.000	.596
enjoy learning science	1.000	.337
learn science quickly	1.000	.612
science is more difficult	1.000	.593
not understand a new topic	1.000	.563
science is not strengths	1.000	.515

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.160	30.856	30.856	2.160	30.856	30.856	2.094	29.908	29.908
2	1.610	23.006	53.863	1.610	23.006	53.863	1.677	23.955	53.863
3	.810	11.565	65.428						
4	.703	10.042	75.470						
5	.631	9.016	84.486						
6	.585	8.352	92.838						
7	.501	7.162	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component	
	1	2
do well in science	.741	.067
take more science	.772	.024
enjoy learning science	.580	-.023
learn science quickly	.779	.072
science is more difficult	.022	.770
not understand a new topic	.002	.750
science is not strengths	.070	.714

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 3 iterations.

Component Transformation Matrix

Component	1	2
1	.938	.348
2	-.348	.938

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Valuing science

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.812
Bartlett's Test of Sphericity	Approx. Chi-Square	8929.328
	df	10
	Sig.	.000

Communalities

	Initial	Extraction
for daily life	1.000	.550
for other subjects	1.000	.549
for university	1.000	.623
for science job	1.000	.270
for job I want	1.000	.680

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.671	53.425	53.425	2.671	53.425	53.425
2	.838	16.756	70.181			
3	.549	10.982	81.163			
4	.532	10.637	91.801			
5	.410	8.199	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
for daily life	.742
for other subjects	.741
for university	.789
for science job	.519
for job I want	.824

Extraction Method: Principal Component Analysis.

[a]. 1 components extracted.

Leaning activities in science

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.894
Bartlett's Test of Sphericity	Approx. Chi-Square	13498.830
	df	91
	Sig.	.000

Communalities

	Initial	Extraction
watch demonstration stu	1.000	.393
formulate hypothesis stu	1.000	.487
design experiment stu	1.000	.478
conduct experiment stu	1.000	.481
work in small group stu	1.000	.319
write explanation stu	1.000	.315
technology on society stu	1.000	.303
relate to daily life stu	1.000	.363
work problem stu	1.000	.519
begin homework	1.000	.637
have quiz	1.000	.281
present work stu	1.000	.436
review homework stu	1.000	.466
listen to lecture stu	1.000	.452

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.747	26.765	26.765	3.747	26.765	26.765	2.597	18.551	18.551
2	1.163	8.304	35.069	1.163	8.304	35.069	2.045	14.609	33.160
3	1.022	7.300	42.369	1.022	7.300	42.369	1.289	9.209	42.369
4	.864	6.170	48.539						
5	.848	6.056	54.595						
6	.814	5.817	60.412						
7	.762	5.440	65.852						
8	.746	5.327	71.179						
9	.726	5.189	76.368						
10	.722	5.155	81.523						
11	.711	5.080	86.603						
12	.682	4.874	91.477						
13	.615	4.393	95.870						
14	.578	4.130	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component		
	1	2	3
watch demonstration stu	.623	.068	.020
formulate hypothesis stu	.684	.049	.130
design experiment stu	.662	.183	.077
conduct experiment stu	.668	.145	.116
work in small group stu	.443	.350	.019
write explanation stu	.500	.254	.007
technology on society stu	.385	.362	.155
relate to daily life stu	.355	.481	-.076
work problem stu	.142	.087	.701
begin homework	.040	.108	.790
have quiz	.281	.420	.163
present work stu	.158	.629	.124
review homework stu	.075	.631	.249
listen to lecture stu	.059	.668	-.054

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 5 iterations.

Component Transformation Matrix

Component	1	2	3
1	.749	.606	.267
2	-.572	.388	.723
3	.335	-.694	.637

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

School climate

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.794
Bartlett's Test of Sphericity	Approx. Chi-Square	8240.428
	df	6
	Sig.	.000

Communalities

	Initial	Extraction
like being in school	1.000	.556
stu do the best	1.000	.622
tch care about stu	1.000	.677
tch want stu to do best	1.000	.660

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.516	62.891	62.891	2.516	62.891	62.891
2	.574	14.342	77.233			
3	.498	12.440	89.673			
4	.413	10.327	100.000			

Component Matrix[a]

	Component
	1
like being in school	.746
stu do the best	.788
tch care about stu	.823
tch want stu to do best	.813

[a]. 1 components extracted.

Out-of-school activities

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.728
Bartlett's Test of Sphericity	Approx. Chi-Square	7089.483
	df	36
	Sig.	.000

Communalities

	Initial	Extraction
watch tv or video	1.000	.789
play computer game	1.000	.644
work paid job	1.000	.531
use internet	1.000	.571
play with friend	1.000	.486
do jobs at home	1.000	.519
play sports	1.000	.352
read book for enjoy	1.000	.466
do homework	1.000	.557

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.352	26.128	26.128	2.352	26.128	26.128	2.254	25.042	25.042
2	1.533	17.028	43.156	1.533	17.028	43.156	1.531	17.006	42.048
3	1.031	11.459	54.615	1.031	11.459	54.615	1.131	12.567	54.615
4	.819	9.103	63.719						
5	.768	8.532	72.250						
6	.673	7.476	79.726						
7	.657	7.296	87.022						
8	.614	6.817	93.839						
9	.554	6.161	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
watch tv or video	.398	.038	.793
play computer game	-.028	.716	.361
work paid job	.156	.626	-.339
use internet	.138	.733	-.121
play with friend	.654	-.130	.204
do jobs at home	.676	-.149	-.200
play sports	.571	.160	-.024
read book for enjoy	.647	.022	-.217
do homework	.721	-.157	-.112

Extraction Method: Principal Component Analysis.

[a]. 3 components extracted.

Rotated Component Matrix[a]

	Component		
	1	2	3
watch tv or video	.179	-.039	.869
play computer game	-.218	.647	.422
work paid job	.145	.683	-.210
use internet	.058	.753	.007
play with friend	.594	-.089	.354
do jobs at home	.718	-.045	-.030
play sports	.530	.221	.148
read book for enjoy	.671	.123	-.034
do homework	.741	-.060	.066

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 5 iterations.

Component Transformation Matrix

Component	1	2	3
1	.958	.106	.265
2	-.142	.983	.117
3	-.248	-.150	.957

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Science teacher questionnaire

Preparation to teach

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.883
Bartlett's Test of Sphericity	Approx. Chi-Square	3114.162
	df	210
	Sig.	.000

Communalities

	Initial	Extraction
ready for biology a	1.000	.862
ready for biology b	1.000	.789
ready for biology c	1.000	.804
ready for biology e	1.000	.661
ready for chemistry a	1.000	.569
ready for physics d	1.000	.500
ready for biology d	1.000	.592
ready for chemistry b	1.000	.653
ready for chemistry c	1.000	.653
ready for chemistry d	1.000	.594
ready for chemistry e	1.000	.695
ready for physics a	1.000	.714
ready for physics b	1.000	.674
ready for physics c	1.000	.720
ready for physics e	1.000	.621
ready for earth science a	1.000	.717
ready for earth science b	1.000	.748
ready for earth science c	1.000	.721
ready for environment a	1.000	.679
ready for environment b	1.000	.619
ready for environment c	1.000	.761

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.627	36.320	36.320	7.627	36.320	36.320	6.262	29.817	29.817
2	4.405	20.974	57.294	4.405	20.974	57.294	4.428	21.086	50.903
3	2.315	11.025	68.319	2.315	11.025	68.319	3.657	17.416	68.319
4	.877	4.175	72.494						
5	.781	3.720	76.214						
6	.713	3.395	79.608						
7	.522	2.486	82.095						
8	.461	2.197	84.292						
9	.404	1.924	86.215						
10	.363	1.728	87.943						
11	.343	1.635	89.578						
12	.323	1.538	91.116						
13	.303	1.443	92.559						
14	.276	1.314	93.873						
15	.234	1.113	94.986						
16	.221	1.051	96.037						
17	.205	.976	97.013						
18	.201	.958	97.971						
19	.166	.790	98.761						
20	.158	.751	99.513						
21	.102	.487	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
ready for biology a	.437	.498	.650
ready for biology b	.479	.516	.542
ready for biology c	.460	.480	.602
ready for biology e	.486	.523	.389
ready for chemistry a	.658	-.300	.215
ready for physics d	.537	-.406	.215
ready for biology d	.564	.473	.223
ready for chemistry b	.693	-.414	.035
ready for chemistry c	.730	-.346	-.014
ready for chemistry d	.657	-.403	-.023
ready for chemistry e	.719	-.421	-.002
ready for physics a	.684	-.495	-.014
ready for physics b	.705	-.419	-.029
ready for physics c	.694	-.488	-.024
ready for physics e	.583	-.530	-.013
ready for earth science a	.542	.519	-.393
ready for earth science b	.532	.506	-.458
ready for earth science c	.586	.375	-.487
ready for environment a	.617	.434	-.332
ready for environment b	.511	.522	-.292
ready for environment c	.639	.460	-.377

Extraction Method: Principal Component Analysis.

[a]. 3 components extracted.

Rotated Component Matrix[a]

	Component		
	1	2	3
ready for biology a	.049	.089	.923
ready for biology b	.063	.191	.865
ready for biology c	.076	.122	.885
ready for biology e	.054	.296	.755
ready for chemistry a	.707	.039	.260
ready for physics d	.684	-.083	.158
ready for biology d	.137	.416	.632
ready for chemistry b	.797	.110	.076
ready for chemistry c	.778	.199	.089
ready for chemistry d	.759	.134	.024
ready for chemistry e	.819	.144	.054
ready for physics a	.840	.092	-.007
ready for physics b	.806	.154	.029
ready for physics c	.842	.107	-.007
ready for physics e	.785	.018	-.063
ready for earth science a	.053	.826	.178
ready for earth science b	.050	.856	.117
ready for earth science c	.175	.830	.047
ready for environment a	.168	.779	.208
ready for environment b	.034	.747	.244
ready for environment c	.166	.834	.196

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 5 iterations.

Pattern Matrix[a]

	Component		
	1	2	3
ready for biology a	-.011	-.087	.957
ready for biology b	-.004	.031	.878
ready for biology c	.014	-.048	.910
ready for biology e	-.018	.165	.744
ready for chemistry a	.704	-.076	.228
ready for physics d	.699	-.184	.143
ready for biology d	.061	.308	.588
ready for chemistry b	.799	.026	.017
ready for chemistry c	.770	.120	.016
ready for chemistry d	.761	.065	-.041
ready for chemistry e	.820	.064	-.014
ready for physics a	.849	.018	-.071
ready for physics b	.806	.081	-.041
ready for physics c	.850	.034	-.073
ready for physics e	.804	-.044	-.114
ready for earth science a	-.042	.840	.041
ready for earth science b	-.045	.883	-.028
ready for earth science c	.089	.857	-.104
ready for environment a	.079	.773	.075
ready for environment b	-.058	.745	.126
ready for environment c	.072	.833	.053

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

[a]. Rotation converged in 6 iterations.

Component Correlation Matrix

Component	1	2	3
1	1.000	.221	.160
2	.221	1.000	.351
3	.160	.351	1.000

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Teacher interaction

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.516
Bartlett's Test of Sphericity	Approx. Chi-Square	133.761
	df	6
	Sig.	.000

Communalities

	Initial	Extraction
develop pedagogy	1.000	.716
develop materials	1.000	.714
develop by visiting	1.000	.796
develop by observing	1.000	.797

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.789	44.730	44.730	1.789	44.730	44.730	1.591	39.776	39.776
2	1.234	30.847	75.577	1.234	30.847	75.577	1.432	35.801	75.577
3	.591	14.786	90.363						
4	.385	9.637	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component	
	1	2
develop pedagogy	.546	.647
develop materials	.580	.614
develop by visiting	.774	-.443
develop by observing	.745	-.491

Extraction Method: Principal Component Analysis.

[a]. 2 components extracted.

Rotated Component Matrix[a]

	Component	
	1	2
develop pedagogy	.051	.845
develop materials	.098	.839
develop by visiting	.886	.107
develop by observing	.891	.051

Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 3 iterations.

Component Transformation Matrix

Component	1	2
1	.802	.597
2	-.597	.802

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Attitudes toward science subject

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.797
Bartlett's Test of Sphericity	Approx. Chi-Square	362.930
	df	36
	Sig.	.000

Communalities

	Initial	Extraction
more than 1 representation	1.000	.590
solving by hypothesis	1.000	.598
learning by memorizing	1.000	.617
scientific investigation	1.000	.593
getting correct answer	1.000	.800
scientific theories	1.000	.488
skill and knowledge	1.000	.503
modelling phenomena	1.000	.590
scientific discoveries	1.000	.681

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.097	34.416	34.416	3.097	34.416	34.416	2.969	32.984	32.984
2	1.313	14.592	49.008	1.313	14.592	49.008	1.393	15.483	48.467
3	1.050	11.665	60.673	1.050	11.665	60.673	1.098	12.205	60.673
4	.786	8.737	69.410						
5	.702	7.796	77.206						
6	.612	6.801	84.007						
7	.586	6.511	90.518						
8	.463	5.143	95.660						
9	.391	4.340	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
more than 1 representation	.738	-.083	.197
solving by hypothesis	.724	-.170	.213
learning by memorizing	.282	.724	.113
scientific investigation	.678	-.362	.055
getting correct answer	.070	.383	.805
scientific theories	.609	.102	-.326
skill and knowledge	.700	.061	-.099
modelling phenomena	.760	-.072	-.084
scientific discoveries	.219	.675	-.421

Extraction Method: Principal Component Analysis.

[a]. 3 components extracted.

Rotated Component Matrix[a]

	Component		
	1	2	3
more than 1 representation	.746	.041	.179
solving by hypothesis	.756	-.044	.157
learning by memorizing	.092	.662	.413
scientific investigation	.750	-.160	-.068
getting correct answer	.023	.025	.894
scientific theories	.538	.383	-.228
skill and knowledge	.651	.278	-.033
modelling phenomena	.745	.172	-.072
scientific discoveries	.008	.820	-.097

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 5 iterations.

Component Transformation Matrix

Component	1	2	3
1	.964	.264	.046
2	-.259	.874	.411
3	.068	-.407	.911

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

School setting

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.745
Bartlett's Test of Sphericity	Approx. Chi-Square	307.946
	df	6
	Sig.	.000

Communalities

	Initial	Extraction
school facility repair	1.000	.256
safe neighbourhood	1.000	.743
feel safe at school	1.000	.807
security policy of school	1.000	.713

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.519	62.981	62.981	2.519	62.981	62.981
2	.834	20.860	83.841			
3	.404	10.098	93.938			
4	.242	6.062	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
school facility repair	.506
safe neighbourhood	.862
feel safe at school	.898
security policy of school	.844

Extraction Method: Principal Component Analysis.

[a]. 1 components extracted.

School climate

KMO and Bartlett's Test

Kaiser-Meyer-Olkin `Measure of Sampling Adequacy.		.806
Bartlett's Test of Sphericity	Approx. Chi-Square	640.342
	df	28
	Sig.	.000

Communalities

	Initial	Extraction
teacher job satisfaction	1.000	.439
teacher success in curr	1.000	.765
teacher understanding curriculum	1.000	.677
teacher expectation for student	1.000	.518
parent support for student	1.000	.649
parent involvement in school	1.000	.742
student regard for school	1.000	.731
student desire to do well	1.000	.617

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.804	47.556	47.556	3.804	47.556	47.556	2.733	34.159	34.159
2	1.334	16.669	64.225	1.334	16.669	64.225	2.405	30.066	64.225
3	.729	9.114	73.339						
4	.656	8.205	81.543						
5	.582	7.270	88.813						
6	.333	4.167	92.980						
7	.316	3.946	96.926						
8	.246	3.074	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component	
	1	2
teacher job satisfaction	.630	.206
teacher success in curr	.705	.518
teacher understanding curriculum	.668	.481
teacher expectation for student	.545	.471
parent support for student	.776	-.215
parent involvement in school	.749	-.425
student regard for school	.734	-.439
student desire to do well	.683	-.388

Extraction Method: Principal Component Analysis.

[a]. 2 components extracted.

Rotated Component Matrix[a]

	Component	
	1	2
teacher job satisfaction	.338	.570
teacher success in curr	.190	.854
teacher understanding curriculum	.186	.802
teacher expectation for student	.100	.713
parent support for student	.726	.349
parent involvement in school	.844	.173
student regard for school	.841	.153
student desire to do well	.770	.157

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 3 iterations.

Component Transformation Matrix

Component	1	2
1	.752	.659
2	-.659	.752

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Content-related activities

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.781
Bartlett's Test of Sphericity	Approx. Chi-Square	506.998
	df	55
	Sig.	.000

Communalities

	Initial	Extraction
watch demonstration	1.000	.622
formulate hypotheses	1.000	.396
design experiment	1.000	.566
conduct experiment	1.000	.638
work in small group	1.000	.642
write explanation	1.000	.751
put event in order	1.000	.485
technology on society	1.000	.588
learn nature and inquiry	1.000	.635
present work	1.000	.346
relate to daily life	1.000	.477

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.618	32.891	32.891	3.618	32.891	32.891	2.259	20.532	20.532
2	1.368	12.439	45.330	1.368	12.439	45.330	2.020	18.365	38.897
3	1.160	10.544	55.874	1.160	10.544	55.874	1.867	16.977	55.874
4	.843	7.667	63.541						
5	.822	7.472	71.013						
6	.727	6.606	77.619						
7	.679	6.169	83.788						
8	.542	4.924	88.712						
9	.520	4.732	93.443						
10	.376	3.422	96.866						
11	.345	3.134	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
watch demonstration	.407	-.006	.675
formulate hypotheses	.492	-.112	.376
design experiment	.617	-.338	.266
conduct experiment	.641	-.423	.220
work in small group	.584	-.418	-.355
write explanation	.634	-.326	-.492
put event in order	.647	.094	-.239
technology on society	.612	.454	-.088
learn nature and inquiry	.523	.601	-.033
present work	.548	.199	-.081
relate to daily life	.555	.408	.046

Extraction Method: Principal Component Analysis.

[a]. 3 components extracted.

Rotated Component Matrix[a]

	Component		
	1	2	3
watch demonstration	.178	-.176	.748
formulate hypotheses	.182	.113	.591
design experiment	.100	.376	.644
conduct experiment	.055	.465	.647
work in small group	.085	.780	.163
write explanation	.202	.841	.053
put event in order	.506	.462	.124
technology on society	.744	.151	.108
learn nature and inquiry	.795	-.014	.057
present work	.507	.251	.162
relate to daily life	.659	.063	.198

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 5 iterations.

Component Transformation Matrix

Component	1	2	3
1	.630	.569	.528
2	.769	-.553	-.321
3	-.109	-.609	.786

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Factors limiting teaching

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.804
Bartlett's Test of Sphericity	Approx. Chi-Square	1676.252
	df	91
	Sig.	.000

Communalities

	Initial	Extraction
limit in academic difference	1.000	.746
limit in background	1.000	.774
limit in special need	1.000	.349
limit in hardware	1.000	.915
limit in software	1.000	.931
limit in using computer	1.000	.842
limit in other equipment	1.000	.826
limit in equipment	1.000	.824
limit in physical facility	1.000	.753
limit in stu/tch ratio	1.000	.347
limit in uninterest	1.000	.724
limit in low morale	1.000	.734
limit disruptive student	1.000	.682
limit in textbook	1.000	.490

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.137	36.690	36.690	5.137	36.690	36.690	3.003	21.450	21.450
2	2.341	16.720	53.410	2.341	16.720	53.410	2.854	20.387	41.837
3	1.348	9.628	63.038	1.348	9.628	63.038	2.391	17.077	58.914
4	1.112	7.941	70.979	1.112	7.941	70.979	1.689	12.065	70.979
5	.849	6.064	77.043						
6	.762	5.441	82.484						
7	.641	4.579	87.063						
8	.500	3.571	90.634						
9	.403	2.877	93.510						
10	.271	1.934	95.445						
11	.246	1.761	97.205						
12	.186	1.326	98.531						
13	.149	1.061	99.593						
14	.057	.407	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component			
	1	2	3	4
limit in academic difference	.515	.327	.082	.607
limit in background	.466	.356	.190	.628
limit in special need	.339	.470	.066	.090
limit in hardware	.764	-.256	-.514	.032
limit in software	.788	-.250	-.495	.054
limit in using computer	.771	-.265	-.420	.019
limit in other equipment	.790	-.333	.299	-.032
limit in equipment	.729	-.300	.408	-.192
limit in physical facility	.767	-.261	.274	-.145
limit in stu/tch ratio	.410	.149	.390	-.067
limit in uninterest	.384	.705	-.067	-.275
limit in low morale	.460	.682	-.161	-.176
limit disruptive student	.343	.646	-.090	-.374
limit in textbook	.593	-.137	.305	-.165

[a]. 4 components extracted.

Rotated Component Matrix[a]

	Component			
	1	2	3	4
limit in academic difference	.129	.185	.167	.817
limit in background	.154	.070	.152	.850
limit in special need	.103	.012	.453	.364
limit in hardware	.225	.921	.090	.088
limit in software	.246	.921	.091	.119
limit in using computer	.297	.860	.078	.094
limit in other equipment	.812	.371	-.046	.168
limit in equipment	.876	.233	.016	.042
limit in physical facility	.790	.344	.059	.083
limit in stu/tch ratio	.495	-.084	.235	.201
limit in uninterest	.076	.039	.838	.121
limit in low morale	.044	.166	.814	.205
limit disruptive student	.078	.043	.821	-.002
limit in textbook	.666	.175	.109	.059

Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 6 iterations.

Component Transformation Matrix

Component	1	2	3	4
1	.648	.609	.325	.323
2	-.289	-.322	.831	.349
3	.652	-.722	-.133	.189
4	-.269	.061	-.431	.859

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Topic coverage

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.829
Bartlett's Test of Sphericity	Approx. Chi-Square	3184.262
	df	946
	Sig.	.000

Communalities

	Initial	Extraction		Initial	Extraction
OTL biology a	1.000	.532	OTL biology b	1.000	.638
OTL biology f	1.000	.579	OTL biology c	1.000	.624
OTL biology g	1.000	.573	OTL biology d	1.000	.619
OTL biology h	1.000	.641	OTL biology e	1.000	.613
OTL biology i	1.000	.575	OTL chemistry a	1.000	.652
OTL biology j	1.000	.617	OTL chemistry b	1.000	.607
OTL biology k	1.000	.708	OTL physics a	1.000	.674
OTL biology l	1.000	.626	OTL physics b	1.000	.585
OTL chemistry c	1.000	.624	OTL physics d	1.000	.561
OTL chemistry d	1.000	.606	OTL physics e	1.000	.796
OTL chemistry e	1.000	.435	OTL physics f	1.000	.704
OTL chemistry f	1.000	.634	OTL physics g	1.000	.667
OTL chemistry g	1.000	.645	OTL physics i	1.000	.560
OTL chemistry h	1.000	.619	OTL physics j	1.000	.585
OTL physics c	1.000	.627	OTL earth science a	1.000	.590
OTL physics h	1.000	.625	OTL earth science b	1.000	.619
OTL earth science d	1.000	.617	OTL earth science c	1.000	.620
OTL earth science f	1.000	.574	OTL earth science e	1.000	.566
OTL earth science i	1.000	.646	OTL earth science g	1.000	.506
OTL environment a	1.000	.598	OTL earth science h	1.000	.506
OTL environment b	1.000	.777	OTL earth science j	1.000	.709
OTL environment c	1.000	.695	OTL earth science k	1.000	.689

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.507	21.607	21.607	9.507	21.607	21.607	5.062	11.504	11.504
2	3.378	7.676	29.283	3.378	7.676	29.283	2.815	6.399	17.902
3	2.393	5.438	34.721	2.393	5.438	34.721	2.735	6.217	24.119
4	1.864	4.236	38.958	1.864	4.236	38.958	2.323	5.281	29.400
5	1.702	3.868	42.826	1.702	3.868	42.826	2.215	5.035	34.435
6	1.442	3.277	46.103	1.442	3.277	46.103	2.161	4.910	39.345
7	1.398	3.177	49.280	1.398	3.177	49.280	2.120	4.819	44.164
8	1.250	2.840	52.121	1.250	2.840	52.121	2.061	4.684	48.848
9	1.193	2.712	54.833	1.193	2.712	54.833	1.687	3.834	52.682
10	1.105	2.511	57.344	1.105	2.511	57.344	1.625	3.694	56.377
11	1.027	2.333	59.677	1.027	2.333	59.677	1.283	2.916	59.292
12	1.006	2.287	61.964	1.006	2.287	61.964	1.176	2.672	61.964
13	.970	2.204	64.168						

14	.927	2.107	66.275							
15	.906	2.059	68.334							
16	.892	2.028	70.362							
17	.846	1.923	72.285							
18	.807	1.834	74.119							
19	.742	1.686	75.805							
20	.722	1.640	77.445							
21	.672	1.527	78.972							
22	.664	1.510	80.482							
23	.611	1.389	81.871							
24	.598	1.359	83.230							
25	.575	1.306	84.536							
26	.561	1.274	85.810							
27	.513	1.165	86.975							
28	.490	1.113	88.089							
29	.480	1.091	89.180							
30	.451	1.025	90.204							
31	.434	.986	91.190							
32	.430	.977	92.168							
33	.392	.891	93.058							
34	.373	.847	93.905							
35	.349	.794	94.699							
36	.346	.787	95.487							
37	.326	.742	96.228							
38	.297	.675	96.904							
39	.284	.644	97.548							
40	.263	.597	98.146							
41	.251	.571	98.717							
42	.239	.544	99.261							
43	.169	.384	99.645							
44	.156	.355	100.000							

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component											
	1	2	3	4	5	6	7	8	9	10	11	12
OTL biology a	.429	.229	.344	-.037	.182	-.051	-.027	.247	-.088	-.203	-.154	.078
OTL biology f	.407	.139	.201	.228	.508	.028	-.091	.093	.124	.005	-.072	.073
OTL biology g	.510	.038	-.008	.322	.235	-.184	-.110	-.061	-.050	.270	.003	.164
OTL biology h	.363	.287	.229	.065	.112	-.051	-.107	-.381	.005	-.119	.362	.230
OTL biology i	.197	.308	.456	-.115	.360	-.062	.119	.071	.056	.039	.215	-.131
OTL biology j	.363	.261	.451	-.102	.112	-.056	-.008	.117	.093	-.393	.093	-.043
OTL biology k	.429	-.052	.051	.335	-.202	.178	-.232	.116	.226	-.273	.160	.339
OTL biology l	.469	-.253	-.026	.282	-.260	.031	-.099	.098	.194	-.048	.337	.142

OTL chemistry c	.369	.389	-.199	-.210	-.324	.084	-.079	.187	-.305	.016	.003	-.080
OTL chemistry d	.425	.396	-.088	.040	-.243	.040	-.322	-.296	.042	.060	-.041	-.031
OTL chemistry e	.443	.074	-.272	-.100	-.066	-.207	-.090	.123	.118	.091	.219	-.091
OTL chemistry f	.410	.299	-.116	.074	-.110	-.511	.123	.115	.201	.032	-.016	-.117
OTL chemistry g	.531	.093	-.021	-.193	-.071	-.316	.111	.004	.293	-.211	-.208	.160
OTL chemistry h	.472	.036	-.088	-.005	-.212	-.472	.132	.153	.234	.137	-.032	-.065
OTL physics c	.445	.191	.166	.182	-.197	.173	-.099	-.117	-.007	-.161	-.001	-.462
OTL physics h	.453	.205	-.347	.024	.250	.120	.136	.052	.172	.321	.068	.146
OTL earth science d	.587	-.251	.171	-.070	-.002	-.129	-.195	-.026	.011	.148	.167	-.265
OTL earth science f	.532	-.333	-.081	-.169	.112	.207	-.029	.033	-.165	-.040	.197	.140
OTL earth science i	.567	-.339	.056	-.200	.157	.218	.206	.133	.110	.125	-.076	-.015
OTL environment a	.461	-.247	.290	.156	-.106	-.068	.349	.029	-.131	.170	.180	.003
OTL environment b	.400	-.078	.464	.196	-.270	.241	.423	-.176	.026	.077	-.093	.027
OTL environment c	.481	-.059	.407	.162	-.302	.153	.299	-.183	.061	.145	.008	-.076
OTL biology b	.520	-.116	.060	.338	-.046	.103	-.378	.035	-.066	-.104	-.250	-.042
OTL biology c	.486	-.264	-.024	.421	-.143	-.101	-.142	.141	-.200	.022	-.088	-.144
OTL biology d	.455	-.101	-.116	.407	.093	.111	.019	.250	-.051	.083	-.342	.109
OTL biology e	.351	.294	.366	.091	.387	.004	-.094	.068	-.169	.235	-.120	-.016
OTL chemistry a	.275	.506	-.129	-.175	-.188	.075	.020	.170	-.312	.142	.156	.246
OTL chemistry b	.416	.503	.162	-.283	-.088	-.093	-.035	.015	-.103	-.049	-.064	.199
OTL physics a	.435	.545	-.074	-.062	-.061	.245	-.019	.314	.036	-.049	-.027	-.112
OTL physics b	.455	.449	.090	-.198	-.240	.131	-.046	-.044	-.075	.158	-.138	-.042
OTL physics d	.484	.211	-.340	.118	.058	.070	.189	-.103	-.002	-.210	.062	-.224
OTL physics e	.547	.167	-.260	.146	.230	-.164	.283	-.263	-.279	-.254	-.037	-.091
OTL physics f	.448	.014	-.413	.103	.220	-.069	.215	-.332	-.194	-.253	-.092	.055
OTL physics g	.294	.347	-.153	-.005	.049	.145	-.192	-.450	.231	.333	-.096	.023
OTL physics i	.376	-.065	-.421	.154	.148	.123	.065	.238	-.056	.046	.236	-.234
OTL physics j	.404	.162	-.390	.092	.068	.271	.201	.045	.321	-.069	.059	.058
OTL earth science a	.522	-.397	-.085	-.105	.010	-.207	-.265	-.052	-.052	-.011	-.139	.068
OTL earth science b	.614	-.353	.129	-.167	-.023	-.083	-.203	-.098	.062	-.044	.060	-.071
OTL earth science c	.589	-.301	.058	-.213	-.133	-.140	.197	-.012	.038	.041	-.201	.119
OTL earth science e	.553	-.272	-.040	-.151	.081	-.185	-.148	-.140	-.239	.103	.108	-.021
OTL earth science g	.527	-.295	.049	-.151	.049	.025	.049	.084	-.268	.012	.164	.065
OTL earth science h	.512	-.189	-.125	-.133	-.253	.083	.096	-.027	-.161	-.080	-.100	.226
OTL earth science j	.538	-.279	.006	-.435	.130	.238	-.147	.016	.205	-.010	-.063	-.101
OTL earth science k	.556	-.292	-.103	-.398	.146	.224	-.008	-.078	.130	-.090	-.112	-.109

Extraction Method: Principal Component Analysis.

[a]. 12 components extracted.

Rotated Component Matrix[a]

	Component											
	1	2	3	4	5	6	7	8	9	10	11	12
OTL biology a	.152	.256	.573	.063	.097	.203	.069	-.051	-.123	.067	.042	-.179
OTL biology f	.104	-.105	.615	-.007	.022	.301	.095	.218	.148	.091	-.043	-.017

OTL biology g	.152	.000	.278	.093	.210	.405	.186	.098	.294	.123	-.197	.266
OTL biology h	.062	.114	.395	.120	.004	-.195	.282	-.113	.355	.419	-.018	.148
OTL biology i	.012	.043	.685	.131	.070	-.226	-.038	.057	.005	-.081	.067	.124
OTL biology j	.118	.152	.605	.090	.127	-.115	.064	-.086	-.122	.231	.251	-.184
OTL biology k	.123	.074	.068	.104	.031	.271	-.014	.127	.039	.749	.061	-.119
OTL biology l	.260	-.023	-.089	.216	.198	.174	-.037	.174	-.015	.606	.070	.176
OTL chemistry c	.102	.737	-.061	-.032	.113	.065	.082	.083	.004	-.021	.178	.058
OTL chemistry d	.056	.384	.014	.010	.146	.111	.123	-.025	.553	.186	.256	-.006
OTL chemistry e	.265	.202	-.006	-.118	.425	-.006	.060	.238	.083	.129	.075	.200
OTL chemistry f	-.043	.160	.144	.033	.729	.070	.163	.099	.067	.018	.075	.027
OTL chemistry g	.295	.129	.163	.066	.537	.010	.199	.024	.070	.140	-.048	-.393
OTL chemistry h	.172	.105	.009	.145	.732	.104	.024	.090	.022	.032	.000	.026
OTL physics c	.085	.177	.151	.247	.051	.149	.127	.039	.149	.094	.656	.036
OTL physics h	.144	.168	.124	.021	.162	.093	.142	.598	.289	.000	-.237	.087
OTL earth science d	.564	-.016	.173	.151	.245	.119	-.048	-.024	.110	.069	.247	.302
OTL earth science f	.631	.114	.042	.079	-.137	.067	.158	.180	-.079	.206	-.087	.132
OTL earth science i	.620	-.022	.141	.296	.033	.112	-.018	.346	-.067	-.068	-.054	-.089
OTL environment a	.264	-.004	.128	.599	.163	.105	.081	.022	-.155	.088	-.062	.269
OTL environment b	.101	.037	.114	.842	-.030	.093	.041	.001	.047	.089	.085	-.121
OTL environment c	.171	.068	.100	.760	.092	.071	.004	.009	.131	.109	.174	.010
OTL biology b	.270	.057	.110	.041	-.002	.621	.072	-.040	.146	.248	.265	-.043
OTL biology c	.231	.009	-.047	.172	.178	.602	.123	-.020	-.087	.160	.199	.237
OTL biology d	.119	.041	.077	.149	.063	.681	.116	.279	-.023	.056	-.077	-.078
OTL biology e	.057	.163	.640	.106	-.033	.274	.002	.005	.194	-.169	-.042	.137
OTL chemistry a	-.045	.751	.079	.012	.042	-.044	.074	.116	.057	.076	-.174	.133
OTL chemistry b	.098	.587	.352	.051	.197	-.072	.102	-.102	.169	.059	-.052	-.164
OTL physics a	-.017	.579	.277	-.009	.110	.099	.001	.393	.048	.053	.258	-.120
OTL physics b	.118	.594	.153	.203	.120	.041	-.006	.042	.312	-.069	.159	-.094
OTL physics d	.093	.164	.036	.049	.159	.047	.509	.381	.071	.061	.285	.010
OTL physics e	.140	.125	.168	.090	.166	.126	.807	.129	.042	-.042	.079	.061
OTL physics f	.204	.028	-.029	-.004	.062	.125	.774	.164	.109	.016	-.042	-.046
OTL physics g	.043	.134	.042	.026	.044	.011	.076	.190	.774	-.030	.030	-.027
OTL physics i	.194	.071	-.048	-.086	.084	.177	.202	.537	-.129	.044	.149	.316
OTL physics j	.075	.100	-.017	.051	.109	.023	.224	.644	.134	.203	.036	-.169
OTL earth science a	.627	-.035	-.043	-.066	.214	.303	.116	-.137	.082	.106	-.036	.013
OTL earth science b	.685	-.038	.104	.114	.184	.099	.037	-.081	.098	.188	.157	.055
OTL earth science c	.570	.080	-.013	.336	.314	.129	.111	-.013	-.025	-.005	-.128	-.178
OTL earth science e	.604	.076	.058	.031	.143	.125	.219	-.106	.101	.026	-.032	.290
OTL earth science g	.568	.155	.101	.176	.000	.093	.148	.035	-.167	.096	-.078	.207
OTL earth science h	.447	.296	-.179	.233	.061	.154	.216	.019	-.036	.167	-.100	-.132
OTL earth science j	.753	.031	.117	-.005	-.003	-.025	-.093	.226	.112	-.005	.145	-.182
OTL earth science k	.733	.013	.043	.034	-.010	-.023	.117	.245	.081	-.054	.133	-.216

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 12 iterations.

Type of homework

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.644
Bartlett's Test of Sphericity	Approx. Chi-Square	141.788
	df	21
	Sig.	.000

Communalities

	Initial	Extraction
homework on problem	1.000	.198
homework on application	1.000	.390
homework on textbook	1.000	.650
homework on definition	1.000	.636
homework on project	1.000	.423
homework on investigation	1.000	.627
homework on report	1.000	.443

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.082	29.739	29.739	2.082	29.739	29.739	1.892	27.027	27.027
2	1.285	18.361	48.100	1.285	18.361	48.100	1.475	21.073	48.100
3	.951	13.587	61.687						
4	.824	11.777	73.464						
5	.736	10.514	83.978						
6	.614	8.767	92.746						
7	.508	7.254	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component	
	1	2
homework on problem	.439	-.066
homework on application	.623	.050
homework on textbook	.425	.685
homework on definition	.463	.650
homework on project	.529	-.379
homework on investigation	.636	-.471
homework on report	.650	-.145

Extraction Method: Principal Component Analysis.

[a]. 2 components extracted.

Rotated Component Matrix[a]

	Component	
	1	2
homework on problem	.416	.157
homework on application	.519	.348
homework on textbook	.036	.806
homework on definition	.087	.793
homework on project	.646	-.072
homework on investigation	.785	-.101
homework on report	.638	.191

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 3 iterations.

Component Transformation Matrix

Component	1	2
1	.873	.488
2	-.488	.873

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Use of homework

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.548
Bartlett's Test of Sphericity	Approx. Chi-Square	81.773
	df	10
	Sig.	.000

Communalities

	Initial	Extraction
homework monitor	1.000	.704
homework feedback	1.000	.738
homework correct	1.000	.516
homework discussion	1.000	.597
homework grade	1.000	.359

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.682	33.644	33.644	1.682	33.644	33.644	1.490	29.802	29.802
2	1.232	24.637	58.281	1.232	24.637	58.281	1.424	28.479	58.281
3	.855	17.106	75.388						
4	.705	14.102	89.489						
5	.526	10.511	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component	
	1	2
homework monitor	.661	-.517
homework feedback	.541	-.668
homework correct	.584	.417
homework discussion	.618	.465
homework grade	.480	.358

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component	
	1	2
homework monitor	.661	-.517
homework feedback	.541	-.668
homework correct	.584	.417
homework discussion	.618	.465
homework grade	.480	.358

Extraction Method: Principal Component Analysis.

[a]. 2 components extracted.

Rotated Component Matrix[a]

	Component	
	1	2
homework monitor	.162	.823
homework feedback	-.027	.859
homework correct	.715	.066
homework discussion	.771	.051
homework grade	.597	.043

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 3 iterations.

Component Transformation Matrix

Component	1	2
1	.757	.653
2	.653	-.757

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

School principal questionnaire

School climate

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.834
Bartlett's Test of Sphericity	Approx. Chi-Square	551.338
	df	28
	Sig.	.000

Communalities

	Initial	Extraction
teacher job satisfaction-p	1.000	.500
teacher understand goals	1.000	.629
teacher degree of success	1.000	.718
teacher expect student	1.000	.454
parent support student	1.000	.588
parent involve school	1.000	.543
student regard school	1.000	.692
student desire do well	1.000	.739

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.806	47.580	47.580	3.806	47.580	47.580	2.706	33.820	33.820
2	1.055	13.186	60.766	1.055	13.186	60.766	2.156	26.946	60.766
3	.827	10.336	71.101						
4	.642	8.022	79.124						
5	.593	7.407	86.531						
6	.401	5.008	91.538						
7	.349	4.367	95.905						
8	.328	4.095	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component	
	1	2
teacher job satisfaction-p	.644	-.291
teacher understand goals	.703	-.367
teacher degree of success	.718	-.449
teacher expect student	.668	-.088
parent support student	.766	.036
parent involve school	.724	.133
student regard school	.599	.577
student desire do well	.682	.523

Extraction Method: Principal Component Analysis.

[a]. 2 components extracted.

Rotated Component Matrix[a]

	Component	
	1	2
teacher job satisfaction-p	.683	.182
teacher understand goals	.777	.160
teacher degree of success	.840	.107
teacher expect student	.573	.355
parent support student	.570	.512
parent involve school	.477	.562
student regard school	.099	.826
student desire do well	.198	.837

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 3 iterations.

Component Transformation Matrix

Component	1	2
1	.775	.633
2	-.633	.775

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Professional development

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.834
Bartlett's Test of Sphericity	Approx. Chi-Square	590.163
	df	10
	Sig.	.000

Communalities

	Initial	Extraction
develop curriculum	1.000	.600
develop school goal	1.000	.773
develop content knowledge	1.000	.769
develop teaching skill	1.000	.778
develop ICT	1.000	.548

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.467	69.339	69.339	3.467	69.339	69.339
2	.561	11.216	80.555			
3	.520	10.396	90.952			
4	.286	5.719	96.670			
5	.166	3.330	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
develop curriculum	.774
develop school goal	.879
develop content knowledge	.877
develop teaching skill	.882
develop ICT	.740

Extraction Method: Principal Component Analysis.

[a]. 1 components extracted.

Student behaviour (frequencies)

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.886
Bartlett's Test of Sphericity	Approx. Chi-Square	1100.199
	df	78
	Sig.	.000

Communalities

	Initial	Extraction
frequency of late arrival	1.000	.667
frequency of absenteeism	1.000	.760
frequency of skipping	1.000	.652
frequency of dress code	1.000	.573
frequency of disturbance	1.000	.547
frequency of profanity	1.000	.646
frequency of vandalism	1.000	.577
frequency of theft	1.000	.656
frequency of intimidating student	1.000	.690
frequency of injury to student	1.000	.523
frequency of cheating	1.000	.444
frequency of intimidating teacher	1.000	.578
frequency of injury to teacher	1.000	.821

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.598	43.062	43.062	5.598	43.062	43.062	4.082	31.398	31.398
2	1.494	11.495	54.557	1.494	11.495	54.557	2.779	21.376	52.774
3	1.041	8.011	62.568	1.041	8.011	62.568	1.273	9.795	62.568
4	.828	6.370	68.938						
5	.721	5.546	74.485						
6	.628	4.834	79.319						
7	.544	4.183	83.502						
8	.479	3.682	87.184						
9	.401	3.087	90.272						
10	.384	2.957	93.228						
11	.346	2.662	95.890						
12	.283	2.178	98.068						
13	.251	1.932	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
frequency of late arrival	.543	-.545	.275
frequency of absenteeism	.583	-.601	.242
frequency of skipping	.738	-.324	.054
frequency of dress code	.710	-.263	.012
frequency of disturbance	.712	-.081	-.183
frequency of profanity	.751	.053	-.282
frequency of vandalism	.705	.252	-.127
frequency of theft	.738	.294	-.157
frequency of intimidating student	.776	.265	-.132
frequency of injury to student	.623	.368	.002
frequency of cheating	.660	-.064	-.064
frequency of intimidating teacher	.576	.383	.316
frequency of injury to teacher	.213	.382	.793

Extraction Method: Principal Component Analysis.

[a]. 3 components extracted.

Rotated Component Matrix[a]

	Component		
	1	2	3
frequency of late arrival	.085	.807	.096
frequency of absenteeism	.105	.864	.050
frequency of skipping	.427	.685	.035
frequency of dress code	.448	.610	.020
frequency of disturbance	.607	.416	-.070
frequency of profanity	.737	.307	-.091
frequency of vandalism	.730	.169	.125
frequency of theft	.787	.147	.123
frequency of intimidating student	.795	.198	.139
frequency of injury to student	.665	.068	.275
frequency of cheating	.527	.407	.032
frequency of intimidating teacher	.513	.116	.549
frequency of injury to teacher	.035	.044	.904

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 6 iterations.

Component Transformation Matrix

Component	1	2	3
1	.804	.567	.177
2	.449	-.776	.443
3	-.389	.277	.879

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Student behaviour (severity)

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.873
Bartlett's Test of Sphericity	Approx. Chi-Square	1034.315
	df	78
	Sig.	.000

Communalities

	Initial	Extraction
severity of late arrival	1.000	.626
severity of absenteeism	1.000	.661
severity of skipping	1.000	.653
severity of dress code	1.000	.609
severity of disturbance	1.000	.438
severity of cheating	1.000	.551
severity of profanity	1.000	.552
severity of vandalism	1.000	.635
severity of theft	1.000	.655
severity of intimidating student	1.000	.569
severity of injury to student	1.000	.533
severity of intimidating teacher	1.000	.744
severity of injury to teacher	1.000	.783

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.439	41.842	41.842	5.439	41.842	41.842	3.230	24.849	24.849
2	1.517	11.668	53.510	1.517	11.668	53.510	2.991	23.009	47.859
3	1.053	8.102	61.612	1.053	8.102	61.612	1.788	13.753	61.612
4	.852	6.556	68.168						
5	.723	5.565	73.733						
6	.621	4.775	78.507						
7	.525	4.037	82.544						
8	.486	3.737	86.281						
9	.435	3.347	89.628						
10	.397	3.051	92.679						
11	.377	2.900	95.578						
12	.293	2.253	97.831						
13	.282	2.169	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
severity of late arrival	.595	-.488	.186
severity of absenteeism	.606	-.536	.088
severity of skipping	.739	-.314	.086
severity of dress code	.625	-.407	.231
severity of disturbance	.634	-.189	.001
severity of cheating	.739	.068	.029
severity of profanity	.672	.207	-.239
severity of vandalism	.620	.049	-.497
severity of theft	.703	.253	-.311
severity of intimidating student	.696	.281	-.070
severity of injury to student	.678	.188	-.197
severity of intimidating teacher	.620	.484	.354
severity of injury to teacher	.418	.479	.616

Extraction Method: Principal Component Analysis.

[a]. 3 components extracted.

Rotated Component Matrix[a]

	Component		
	1	2	3
severity of late arrival	.126	.778	.066
severity of absenteeism	.178	.793	-.029
severity of skipping	.350	.713	.148
severity of dress code	.147	.751	.157
severity of disturbance	.374	.532	.121
severity of cheating	.519	.417	.328
severity of profanity	.690	.199	.191
severity of vandalism	.761	.210	-.108
severity of theft	.772	.165	.176
severity of intimidating student	.626	.206	.365
severity of injury to student	.661	.228	.212
severity of intimidating teacher	.378	.128	.765
severity of injury to teacher	.072	.080	.879

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 5 iterations.

Component Transformation Matrix

Component	1	2	3
1	.695	.621	.363
2	.350	-.733	.583
3	-.628	.278	.727

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Instructional resources

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.918
Bartlett's Test of Sphericity	Approx. Chi-Square	4108.621
	df	171
	Sig.	.000

Communalities

	Initial	Extraction
shortage of building and ground	1.000	.636
shortage of heat/cool and light	1.000	.563
shortage of space	1.000	.621
shortage for handicapped	1.000	.228
shortage of computer for math	1.000	.793
shortage of software for math	1.000	.793
shortage of calculator for math	1.000	.727
shortage of library for math	1.000	.833
shortage of AV for math	1.000	.862
shortage of lab equipment	1.000	.635
shortage of computer for science	1.000	.856
shortage of software for science	1.000	.902
shortage of calculator for science	1.000	.799
shortage of library for science	1.000	.841
shortage of AV for science	1.000	.880
shortage of teacher	1.000	.324
shortage of computer staff	1.000	.765
shortage of material	1.000	.515
shortage of budget	1.000	.544

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.696	56.296	56.296	10.696	56.296	56.296	9.602	50.539	50.539
2	2.423	12.753	69.048	2.423	12.753	69.048	3.517	18.509	69.048
3	.924	4.862	73.910						
4	.824	4.336	78.247						
5	.761	4.006	82.252						
6	.572	3.010	85.262						
7	.452	2.378	87.640						
8	.415	2.185	89.825						
9	.382	2.011	91.835						
10	.329	1.732	93.567						
11	.310	1.634	95.201						
12	.237	1.245	96.446						
13	.182	.957	97.403						
14	.144	.759	98.162						
15	.115	.607	98.769						
16	.093	.490	99.259						
17	.063	.331	99.590						
18	.040	.213	99.803						
19	.037	.197	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component	
	1	2
shortage of building and ground	.453	.657
shortage of heat/cool and light	.634	.401
shortage of space	.302	.728
shortage for handicapped	.476	.045
shortage of computer for math	.863	-.220
shortage of software for math	.861	-.228
shortage of calculator for math	.852	.041
shortage of library for math	.897	-.169
shortage of AV for math	.910	-.182
shortage of lab equipment	.785	.136
shortage of computer for science	.888	-.260
shortage of software for science	.899	-.307
shortage of calculator for science	.894	.025
shortage of library for science	.908	-.127

shortage of AV for science	.919	-.191
shortage of teacher	.194	.535
shortage of computer staff	.870	-.091
shortage of material	.442	.565
shortage of budget	.507	.536

Extraction Method: Principal Component Analysis.

[a]. 2 components extracted.

Rotated Component Matrix[a]

	Component	
	1	2
shortage of building and ground	.183	.776
shortage of heat/cool and light	.445	.604
shortage of space	.017	.788
shortage for handicapped	.427	.215
shortage of computer for math	.884	.108
shortage of software for math	.885	.101
shortage of calculator for math	.778	.348
shortage of library for math	.897	.168
shortage of AV for math	.914	.161
shortage of lab equipment	.682	.412
shortage of computer for science	.922	.081
shortage of software for science	.949	.040
shortage of calculator for science	.823	.348
shortage of library for science	.892	.212
shortage of AV for science	.925	.156
shortage of teacher	-.014	.569
shortage of computer staff	.844	.231
shortage of material	.206	.687
shortage of budget	.277	.684

Rotation Method: Varimax with Kaiser Normalization.

[a]. Rotation converged in 3 iterations.

Component Transformation Matrix

Component	1	2
1	.932	.364
2	-.364	.932

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Appendix G: Reliability analysis of the Korean data

Student questionnaire

Home possession (16 items)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.638	.677	16

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.768	.146	.994	.849	6.820	.079	16
Item Variances	.105	.006	.250	.244	45.323	.006	16
Inter-Item Correlations	.116	.003	.469	.465	142.891	.004	16

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
calculator at home	11.3238	4.000	.185	.	.632
computer at home	11.3134	3.958	.310	.	.624
desk at home	11.3214	3.953	.265	.	.626
dictionary at home	11.3013	4.078	.184	.	.634
study room at home	11.4955	3.626	.244	.	.625
camera at home	11.3616	3.808	.290	.	.619
car at home	11.4797	3.480	.364	.	.603
audio-com at home	11.4951	3.592	.268	.	.620
VCR at home	11.3934	3.753	.272	.	.620
mobilephone at home	11.3653	3.826	.262	.	.622
printer at home	11.3733	3.757	.311	.	.616
washing machine at home	11.2961	4.101	.192	.	.635
kimchi-refrigerator at home	11.7701	3.395	.283	.	.622
laptop at home	12.1448	3.753	.208	.	.629
airconditioner at home	11.8429	3.332	.320	.	.613
video cam at home	12.0816	3.567	.278	.	.619

Home possession (4 items)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.403	.506	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.788	.446	.977	.532	2.193	.057	4
Item Variances	.125	.022	.247	.225	11.105	.010	4
Inter-Item Correlations	.204	.087	.469	.381	5.382	.017	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
computer at home	2.1739	.619	.312	.231	.346
car at home	2.3402	.429	.257	.071	.294
printer at home	2.2338	.530	.273	.232	.303
air conditioner at home	2.7055	.350	.200	.042	.422

Liking science

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.859	.863	7

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.374	2.168	2.656	.487	1.225	.036	7
Item Variances	.660	.479	.743	.264	1.550	.010	7
Inter-Item Correlations	.473	.233	.657	.425	2.823	.012	7

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
do well in science	14.3772	13.401	.718	.554	.829
take more science	14.4465	13.252	.565	.459	.849
enjoy learning science	14.2976	12.720	.660	.535	.834
learn science quickly	14.3413	13.306	.668	.470	.834
science is more difficult	13.9930	12.999	.638	.458	.838
not understand a new topic	13.9592	13.816	.481	.299	.860
science is not strengths	14.2744	12.736	.685	.504	.831

Valuing science

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.814	.812	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.522	1.972	2.932	.960	1.487	.124	5
Item Variances	.723	.619	.872	.253	1.409	.012	5
Inter-Item Correlations	.464	.342	.699	.358	2.048	.014	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
for daily life	9.6764	7.498	.518	.370	.801
for other subjects	10.0427	7.328	.565	.404	.788
for university	9.9407	6.564	.671	.528	.756
for science job	10.6364	6.985	.583	.381	.783
for job I want	10.1378	6.294	.680	.573	.753

Learning activities (Practical Learning)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.770	.772	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.652	2.448	2.945	.497	1.203	.046	4
Item Variances	.849	.580	1.044	.464	1.801	.048	4
Inter-Item Correlations	.459	.316	.652	.336	2.061	.015	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
conduct experiment stu	7.66	5.283	.619	.389	.700
work in small group stu	8.05	4.239	.653	.492	.668
WHY write explanation stu	8.16	4.368	.631	.456	.681
watch demonstration stu	7.95	5.566	.413	.204	.790

Learning activities (STS Learning)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.619	.625	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.802	2.678	3.036	.359	1.134	.041	3
Item Variances	.841	.726	.946	.220	1.304	.012	3
Inter-Item Correlations	.357	.281	.495	.214	1.761	.011	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
technology on society stu	5.37	2.325	.479	.265	.455
relate to daily life stu	5.71	2.137	.484	.271	.436
review homework stu	5.73	2.354	.333	.111	.661

Liking school

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.704	.704	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.856	2.639	3.324	.685	1.260	.102	4
Item Variances	.590	.507	.634	.127	1.251	.003	4
Inter-Item Correlations	.373	.279	.452	.173	1.621	.004	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
like being in school	8.6370	3.130	.452	.212	.665
stu do the best	8.7838	3.057	.494	.250	.638
tch care about stu	8.7498	2.845	.566	.328	.591
tch want stu to do best	8.0986	3.324	.450	.228	.665

Safe school

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.596	.631	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.876	.763	.981	.219	1.287	.007	5
Item Variances	.104	.019	.181	.163	9.782	.004	5
Inter-Item Correlations	.255	.142	.370	.228	2.601	.003	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
mine was stolen	3.6155	.601	.316	.102	.585
hit or hurt by other stu	3.4678	.697	.444	.212	.498
made to do things by oth stu	3.4959	.668	.416	.198	.506
made fun of or called names	3.5359	.636	.382	.161	.525
left out of activities	3.3968	.890	.324	.117	.584

Out-of school activities (Play after school)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.636	.637	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.900	1.753	1.989	.236	1.134	.017	3
Item Variances	1.246	1.099	1.483	.384	1.350	.043	3
Inter-Item Correlations	.369	.317	.470	.153	1.484	.006	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
watch tv or video	3.7127	3.783	.371	.138	.635
play computer game	3.9483	2.977	.483	.252	.485
use internet	3.7418	3.469	.492	.254	.478

Computer use

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.717	.715	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.580	1.422	1.732	.309	1.217	.024	3
Item Variances	1.033	.948	1.189	.241	1.254	.018	3
Inter-Item Correlations	.456	.340	.614	.274	1.804	.016	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
look up ideas for science	3.3171	3.464	.421	.182	.758
write reports	3.0078	3.012	.577	.386	.581
analyze data	3.1538	2.560	.627	.424	.508
use internet	3.7418	3.469	.492	.254	.478

Science teacher questionnaire

Preparation to teach (Pchemistry)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.933	.934	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.527	1.369	1.614	.245	1.179	.009	5
Item Variances	.212	.194	.235	.041	1.209	.000	5
Inter-Item Correlations	.740	.556	.857	.301	1.542	.009	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
ready for chemistry a	6.0193	2.696	.894	.828	.905
ready for chemistry b	6.0816	2.720	.826	.767	.917
ready for chemistry c	6.0749	2.709	.864	.754	.910
ready for chemistry d	6.2647	2.821	.693	.539	.943
ready for chemistry e	6.0942	2.665	.847	.729	.913

Preparation to teach (Pphysics)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.913	.915	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.464	1.129	1.627	.497	1.440	.037	5
Item Variances	.232	.198	.259	.060	1.305	.001	5
Inter-Item Correlations	.682	.544	.837	.294	1.540	.013	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
ready for physics a	5.7809	2.763	.828	.744	.883
ready for physics b	5.8018	2.736	.837	.759	.881
ready for physics c	6.1897	3.013	.609	.373	.928
ready for physics d	5.8111	2.723	.785	.648	.892
ready for physics e	5.6925	2.826	.853	.753	.880

Preparation to teach (Pbiology)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.881	.882	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.308	1.163	1.524	.361	1.310	.017	5
Item Variances	.214	.195	.245	.051	1.261	.000	5
Inter-Item Correlations	.599	.432	.707	.275	1.635	.007	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
ready for biology a	5.2636	2.362	.759	.598	.845
ready for biology b	5.0144	2.531	.608	.407	.880
ready for biology c	5.2354	2.353	.792	.636	.838
ready for biology d	5.3753	2.267	.741	.568	.850
ready for biology e	5.2646	2.409	.684	.515	.863

Preparation to teach (Penvironment)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.922	.923	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.190	1.144	1.226	.082	1.072	.002	3
Item Variances	.218	.200	.248	.048	1.243	.001	3
Inter-Item Correlations	.801	.764	.849	.085	1.112	.002	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
ready for environment a	2.3434	.838	.807	.654	.916
ready for environment b	2.4258	.726	.853	.745	.882
ready for environment c	2.3702	.788	.874	.768	.863

Preparation to teach (Pearth science)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.866	.867	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.357	1.265	1.451	.186	1.147	.009	3
Item Variances	.216	.211	.221	.010	1.047	.000	3
Inter-Item Correlations	.684	.603	.821	.218	1.362	.011	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
ready for earth science a	2.6201	.704	.788	.687	.771
ready for earth science b	2.7155	.702	.809	.702	.752
ready for earth science c	2.8064	.779	.645	.418	.902

Professional development

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.800	.800	6

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.374	.255	.524	.268	2.051	.010	6
Item Variances	.151	.130	.161	.031	1.238	.000	6
Inter-Item Correlations	.400	.199	.571	.372	2.871	.009	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
develop content	1.7174	1.962	.534	.399	.774
develop pedagogy/instruction	1.8788	1.865	.625	.424	.752
develop science curriculum	1.8403	1.905	.597	.417	.759
develop IT	1.8198	1.972	.514	.278	.779
develop inquiry skill	1.9640	2.057	.483	.371	.785
develop science assessment	1.9859	1.992	.579	.382	.764

Attitudes towards subject (Inquiry practice)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.602	.601	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.251	3.025	3.440	.414	1.137	.044	3
Item Variances	.204	.174	.234	.059	1.341	.001	3
Inter-Item Correlations	.335	.227	.423	.196	1.862	.008	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
more than 1 representation	6.3127	.579	.349	.133	.590
solving by hypothesis	6.7271	.463	.494	.249	.369
scientific investigation	6.4651	.591	.399	.186	.522

Attitudes towards subject (Knowledge practice)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.489	.485	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.440	1.950	2.848	.898	1.461	.207	3
Item Variances	.180	.158	.206	.048	1.306	.001	3
Inter-Item Correlations	.239	.139	.309	.169	2.217	.006	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
getting correct answer	5.3703	.500	.255	.076	.471
skill and knowledge	4.7984	.380	.383	.147	.244
modelling phenomena	4.4721	.461	.288	.099	.421

School setting (School environment)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.614	.642	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.646	2.236	2.861	.624	1.279	.080	4
Item Variances	.239	.152	.404	.252	2.652	.013	4
Inter-Item Correlations	.310	.207	.471	.264	2.273	.009	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
school facility repair	8.3485	.935	.354	.131	.612
safe neighbourhood	7.7765	1.129	.424	.240	.521
feel safe at school	7.7241	1.168	.538	.320	.466
security policy of school	7.9052	1.273	.334	.144	.584

School climate (High expectation)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.854	.853	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.051	2.612	3.638	1.026	1.393	.141	5
Item Variances	.512	.425	.592	.167	1.392	.005	5
Inter-Item Correlations	.538	.435	.812	.377	1.867	.011	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
teacher expectation for student	11.6195	5.825	.579	.348	.845
parent support for student	12.2648	4.922	.750	.692	.801
parent involvement in school	12.3472	5.020	.735	.679	.805
student regard for school	12.6453	5.505	.602	.396	.841
student desire to do well	12.1515	5.506	.675	.472	.822

School climate (Professional teaching force)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.720	.725	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.410	3.196	3.648	.452	1.141	.052	3
Item Variances	.351	.318	.402	.085	1.267	.002	3
Inter-Item Correlations	.467	.359	.570	.212	1.589	.009	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
teacher job satisfaction	7.0331	1.022	.468	.235	.726
Teacher understand curriculum	6.8442	.999	.629	.407	.527
teacher success in curriculum	6.5809	1.057	.534	.336	.638

Content-related activities (Explanation work)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.687	.703	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.476	1.075	2.045	.970	1.903	.256	3
Item Variances	.372	.208	.520	.312	2.501	.025	3
Inter-Item Correlations	.441	.320	.510	.190	1.594	.009	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
technology on society	3.3536	1.350	.472	.267	.657
learn nature and inquiry	3.1195	.938	.608	.382	.449
relate to daily life	2.3833	.885	.482	.250	.655

Factors limiting teaching (Student resource)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.831	.830	6

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.303	.753	1.634	.882	2.172	.135	6
Item Variances	.334	.295	.378	.083	1.282	.001	6
Inter-Item Correlations	.448	.233	.804	.571	3.450	.028	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
limit in academic difference	6.4130	4.858	.563	.377	.811
limit in background	6.8825	4.994	.461	.269	.831
limit in special need	7.0679	5.086	.417	.197	.840
limit in uninterest	6.2842	4.312	.783	.708	.765
limit in low morale	6.2684	4.250	.739	.708	.773
limit disruptive student	6.1863	4.507	.667	.553	.789

Factors limiting teaching (Physical resource)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.796	.801	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.910	.805	1.052	.247	1.307	.016	3
Item Variances	.403	.353	.455	.102	1.289	.003	3
Inter-Item Correlations	.573	.471	.734	.263	1.560	.016	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
limit in other equipment	1.9253	1.185	.719	.575	.637
limit in equipment	1.8567	1.293	.688	.551	.678
limit in physical facility	1.6781	1.304	.529	.283	.846

Factors limiting teaching (Computer resource)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.792	.792	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.907	.877	.966	.090	1.102	.003	3
Item Variances	.416	.400	.432	.032	1.081	.000	3
Inter-Item Correlations	.560	.532	.590	.057	1.108	.001	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
limit in hardware	1.8454	1.275	.655	.430	.695
limit in software	1.7557	1.347	.611	.374	.742
limit in using computer	1.8427	1.269	.636	.408	.715

Topic coverage (Ophysics)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.811	.821	9

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.739	.423	.900	.477	2.129	.025	9
Item Variances	.115	.060	.169	.110	2.839	.002	9
Inter-Item Correlations	.337	.081	.750	.669	9.296	.018	9

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
OTL physics a	5.8642	2.913	.596	.457	.781
OTL physics b	5.7478	3.088	.646	.530	.782
OTL physics c	6.2249	3.019	.368	.226	.814
OTL physics d	5.9786	2.860	.563	.402	.785
OTL physics e	5.9470	2.752	.631	.632	.775
OTL physics f	6.0366	2.778	.550	.591	.787
OTL physics g	5.7575	3.191	.481	.430	.797
OTL physics i	5.7502	3.287	.385	.332	.806
OTL physics j	5.8736	3.065	.444	.249	.800

Topic coverage (Ochemistry)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.794	.789	8

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.434	.162	.912	.750	5.615	.095	8
Item Variances	.114	.056	.169	.112	2.996	.002	8
Inter-Item Correlations	.319	.073	.731	.658	9.984	.034	8

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
OTL chemistry a	2.5595	2.700	.305	.467	.796
OTL chemistry b	2.5644	2.687	.312	.474	.795
OTL chemistry c	3.0981	2.210	.503	.323	.773
OTL chemistry d	3.0247	2.221	.502	.287	.773
OTL chemistry e	3.3090	2.285	.611	.547	.754
OTL chemistry f	3.2054	2.191	.609	.534	.752
OTL chemistry g	3.2664	2.123	.732	.696	.732
OTL chemistry h	3.2725	2.460	.435	.260	.780

Topic coverage (Oearth science)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.827	.832	11

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.645	.306	.905	.598	2.954	.034	11
Item Variances	.133	.063	.160	.098	2.558	.001	11
Inter-Item Correlations	.310	.026	.827	.801	31.583	.032	11

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
OTL earth science a	6.3162	4.896	.566	.	.807
OTL earth science b	6.4283	4.639	.666	.	.796
OTL earth science c	6.3791	4.613	.718	.	.792
OTL earth science d	6.6309	4.961	.432	.	.820
OTL earth science e	6.3277	4.911	.548	.	.808
OTL earth science f	6.7836	5.121	.363	.	.825
OTL earth science g	6.1852	5.199	.553	.	.812
OTL earth science h	6.2752	5.208	.383	.	.822
OTL earth science i	6.6790	4.958	.435	.	.819
OTL earth science j	6.4908	4.977	.432	.	.819
OTL earth science k	6.4019	5.015	.447	.	.818

Topic coverage (Obiology)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.766	.772	12

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.474	.178	.890	.712	5.011	.073	12
Item Variances	.119	.057	.165	.108	2.906	.001	12
Inter-Item Correlations	.220	-.107	.688	.796	-6.417	.021	12

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
OTL biology a	5.3507	4.049	.375	.	.754
OTL biology b	4.9165	4.246	.310	.	.760
OTL biology c	4.8998	4.295	.278	.	.763
OTL biology d	4.8450	4.216	.439	.	.747
OTL biology e	4.7937	4.336	.402	.	.752
OTL biology f	5.4322	4.003	.467	.	.742
OTL biology g	5.2664	4.113	.312	.	.762
OTL biology h	5.5061	4.149	.419	.	.748
OTL biology i	5.4964	4.127	.444	.	.746
OTL biology j	5.4197	3.940	.508	.	.737
OTL biology k	5.3811	3.967	.466	.	.742
OTL biology l	5.2130	3.910	.460	.	.743

Topic coverage (Oenvironment)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.860	.863	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.208	.183	.246	.063	1.346	.001	3
Item Variances	.109	.102	.121	.019	1.187	.000	3
Inter-Item Correlations	.677	.543	.821	.278	1.513	.016	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
OTL environment a	.4422	.375	.741	.674	.799
OTL environment b	.4294	.343	.844	.744	.702
OTL environment c	.3790	.375	.635	.446	.902

Type of homework (Knowledge homework)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.507	.517	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.916	.862	1.019	.157	1.182	.008	3
Item Variances	.191	.134	.267	.134	2.001	.005	3
Inter-Item Correlations	.263	.191	.311	.120	1.626	.003	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
homework on problem	1.7299	.473	.386	.151	.305
homework on application	1.8807	.574	.288	.094	.466
homework on textbook	1.8870	.394	.317	.108	.444

School principal questionnaire

School climate

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.898	.899	8

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.346	2.801	3.743	.941	1.336	.111	8
Item Variances	.824	.621	1.055	.434	1.698	.019	8
Inter-Item Correlations	.527	.350	.791	.441	2.262	.011	8

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
teacher job satisfaction-p	23.1397	25.454	.596	.457	.893
teacher understand goals	23.0221	24.348	.683	.551	.886
teacher degree of success	23.2353	23.974	.725	.616	.882
teacher expect student	23.2279	23.555	.737	.602	.880
parent support student	23.6029	22.937	.694	.711	.885
parent involve school	23.7941	23.365	.685	.652	.885
student regard school	23.9632	24.450	.616	.518	.892
student desire do well	23.3676	23.419	.735	.641	.880

Parent involvement

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.341	.360	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.759	.515	.868	.353	1.686	.027	4
Item Variances	.164	.116	.252	.136	2.175	.004	4
Inter-Item Correlations	.123	.049	.207	.157	4.196	.004	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
parent attend event	2.1691	.630	.248	.076	.217
parent volunteer project	2.5221	.518	.153	.026	.332
parent ensure homework	2.1985	.634	.185	.046	.274
parent serve committee	2.2206	.632	.156	.045	.305

Professional development

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.721	.726	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.118	.949	1.279	.331	1.349	.018	4
Item Variances	.313	.264	.366	.102	1.385	.003	4
Inter-Item Correlations	.399	.286	.644	.359	2.256	.016	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
develop curriculum	3.5221	1.792	.474	.233	.679
develop content knowledge	3.3382	1.618	.645	.476	.584
develop teaching skill	3.3603	1.521	.562	.427	.626
develop ICT	3.1912	1.771	.383	.152	.737

Student behaviour (Low moralef)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.815	.825	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.256	.713	1.647	.934	2.309	.151	5
Item Variances	1.063	.473	1.712	1.239	3.621	.291	5
Inter-Item Correlations	.485	.351	.617	.266	1.756	.008	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
frequency of late arrival	4.9044	9.391	.720	.533	.743
frequency of absenteeism	5.2721	11.800	.572	.357	.795
frequency of skipping	5.5662	12.351	.509	.267	.811
frequency of dress code	4.7426	8.963	.687	.480	.754
frequency of disturbance	4.6324	8.664	.637	.413	.779

Student behaviour (Bulleyingf)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.805	.814	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.763	.574	.941	.368	1.641	.024	5
Item Variances	.329	.232	.456	.224	1.963	.009	5
Inter-Item Correlations	.466	.367	.572	.205	1.560	.004	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
frequency of profanity	2.8750	2.821	.594	.399	.771
frequency of vandalism	3.0662	2.981	.574	.357	.775
frequency of theft	3.2426	3.311	.591	.394	.770
frequency of intimidating student	2.9265	3.224	.675	.468	.749
frequency of injury to student	3.1544	3.183	.564	.338	.776

Student behaviour (Low morales)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.848	.855	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.347	.235	.456	.221	1.938	.008	5
Item Variances	.257	.196	.324	.128	1.652	.003	5
Inter-Item Correlations	.541	.385	.661	.276	1.718	.009	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
severity of late arrival	1.4632	2.725	.697	.528	.809
severity of absenteeism	1.2794	2.692	.529	.317	.857
severity of skipping	1.5000	2.726	.740	.565	.800
severity of dress code	1.3529	2.630	.659	.479	.817
severity of disturbance	1.3456	2.524	.706	.530	.804

Instructional resources (Science resource)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.901	.901	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.270	1.213	1.316	.103	1.085	.002	4
Item Variances	.690	.641	.722	.081	1.126	.001	4
Inter-Item Correlations	.695	.603	.865	.262	1.434	.009	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
shortage of lab equipment	3.7941	5.187	.691	.510	.903
shortage of AV for science	3.7647	4.966	.744	.581	.885
shortage of computer for science	3.8676	4.723	.845	.789	.847
shortage of software for science	3.8162	4.892	.840	.793	.850

Instructional resources (Math resource)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.831	.839	6

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.074	.842	1.271	.429	1.509	.025	6
Item Variances	.705	.527	1.018	.491	1.933	.030	6
Inter-Item Correlations	.464	.282	.767	.485	2.717	.014	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
shortage for handicapped	5.2782	9.869	.451	.240	.843
shortage of computer for math	5.2857	9.448	.664	.629	.790
shortage of software for math	5.1729	9.811	.659	.651	.793
shortage of calculator for math	5.4962	9.555	.674	.509	.789
shortage of calculator for science	5.6015	10.226	.598	.427	.805
shortage of library for math	5.3835	10.314	.624	.421	.801

Instructional resources (Infra resource)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.761	.761	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.990	.868	1.110	.243	1.280	.015	3
Item Variances	.815	.778	.871	.094	1.120	.002	3
Inter-Item Correlations	.515	.498	.548	.049	1.099	.001	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
shortage of building and ground	2.1029	2.360	.604	.367	.667
shortage of heat/cool and light	1.8603	2.551	.567	.322	.707
shortage of space	1.9779	2.496	.606	.369	.665

Appendix H: Reliability analysis of the South African data

Student questionnaire

Home possession (11 items)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.793	.794	11

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.567	.338	.797	.459	2.356	.028	11
Item Variances	.220	.162	.250	.088	1.544	.001	11
Inter-Item Correlations	.259	.091	.448	.356	4.892	.006	11

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
computer at home	5.8931	7.588	.330	.137	.789
specific08 at home	5.8396	7.050	.534	.327	.767
specific12 at home	5.7947	7.170	.473	.262	.774
specific13 at home	5.8451	7.415	.385	.182	.784
dictionary at home	5.5162	7.652	.328	.121	.789
specific05 at home	5.4537	7.485	.446	.280	.777
specific06 at home	5.6035	7.346	.417	.229	.780
specific07 at home	5.4343	7.448	.485	.281	.774
specific09 at home	5.7105	7.077	.507	.285	.770
specific15 at home	5.7073	7.079	.506	.262	.770
specific16 at home	5.5178	7.169	.537	.349	.768

Liking science (Enjoying science)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.696	.691	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.256	3.068	3.473	.404	1.132	.027	4
Item Variances	1.046	.726	1.268	.542	1.747	.060	4
Inter-Item Correlations	.359	.245	.471	.227	1.927	.009	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
do well in science	9.7817	5.434	.504	.269	.618
take more science	9.7845	4.938	.537	.291	.595
learn science quickly	9.9568	4.791	.547	.320	.588
enjoy learning science	9.5526	6.527	.345	.125	.706

Liking science (Self-confidence)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.602	.602	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.440	2.387	2.476	.090	1.038	.002	3
Item Variances	1.163	1.121	1.185	.063	1.057	.001	3
Inter-Item Correlations	.335	.302	.370	.068	1.227	.001	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
science is more difficult	4.9328	3.080	.436	.191	.464
not understand a new topic	4.8432	3.077	.411	.173	.501
science is not strengths	4.8632	3.155	.384	.148	.540

Valuing science

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.796	.796	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.231	3.116	3.429	.313	1.100	.019	4
Item Variances	1.194	.982	1.334	.352	1.358	.023	4
Inter-Item Correlations	.494	.452	.574	.122	1.270	.002	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
for daily life	9.4948	7.701	.576	.332	.761
for other subjects	9.8075	7.257	.577	.333	.760
for university	9.7180	6.869	.631	.406	.733
for job I want	9.7510	6.649	.649	.427	.724

Learning activities (Inquiry Learning)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.697	.697	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.070	1.931	2.206	.275	1.142	.016	5
Inter-Item Correlations	.315	.221	.428	.207	1.940	.003	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
watch demonstration stu	8.42	7.775	.416	.183	.664
formulate hypothesis stu	8.14	7.615	.484	.238	.635
design experiment stu	8.26	7.410	.497	.261	.628
conduct experiment stu	8.18	7.462	.495	.257	.630
write explanation stu	8.41	8.131	.372	.141	.680

Learning activities (Lecture Learning)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.528	.528	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.667	1.607	1.717	.110	1.069	.003	3
Inter-Item Correlations	.272	.237	.319	.082	1.344	.001	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
present work stu	3.28	2.018	.351	.127	.411
review homework stu	3.32	2.107	.369	.137	.382
listen to lecture stu	3.39	2.307	.305	.094	.483

Liking school

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.803	.803	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.409	3.295	3.563	.268	1.081	.014	4
Item Variances	1.097	.902	1.191	.289	1.320	.018	4
Inter-Item Correlations	.504	.452	.583	.131	1.289	.002	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
like being in school	10.0721	7.271	.559	.314	.781
stu do the best	10.3405	6.573	.612	.375	.756
tch care about stu	10.2892	6.255	.658	.438	.733
tch want stu to do best	10.2046	6.366	.644	.424	.740

Safe school

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.401	.404	5

Inter-Item Correlation Matrix

	mine was stolen	hit or hurt by other stu	made to do things by oth stu	made fun of or called names	left out of activities
mine was stolen	1.000	.012	-.015	.070	-.026
hit or hurt by other stu	.012	1.000	.126	.167	.194
made to do things by oth stu	-.015	.126	1.000	.158	.313
made fun of or called names	.070	.167	.158	1.000	.196
left out of activities	-.026	.194	.313	.196	1.000

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.574	.456	.678	.221	1.485	.010	5
Item Variances	.237	.218	.250	.031	1.143	.000	5
Inter-Item Correlations	.119	-.026	.313	.339	-12.139	.011	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
mine was stolen	2.3896	1.473	.017	.007	.488
made fun of or called names	2.4139	1.212	.258	.070	.304
hit or hurt by other stu	2.1927	1.297	.214	.058	.341
made to do things by oth stu	2.2471	1.236	.253	.111	.310
left out of activities	2.2379	1.195	.299	.139	.272

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.502	.501	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.598	.480	.674	.194	1.403	.007	4
Item Variances	.235	.220	.250	.030	1.135	.000	4
Inter-Item Correlations	.201	.116	.301	.185	2.590	.003	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
made fun of or called names	1.91	.970	.294	.430
hit or hurt by other stu	1.72	1.062	.235	.481
made to do things by oth stu	1.78	.985	.297	.428
left out of activities	1.77	.943	.353	.376

Out-of school activities (Study after school)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.650	.650	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.952	2.787	3.126	.339	1.122	.029	3
Inter-Item Correlations	.383	.322	.414	.092	1.285	.002	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
do jobs at home	5.91	4.943	.438	.199	.584
read book for enjoy	6.07	5.056	.436	.198	.585
do homework	5.73	4.765	.508	.258	.487

Science teacher questionnaire

Preparation to teach (Pphysics & chemistry)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.933	.933	10

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.298	1.076	1.551	.475	1.441	.026	10
Item Variances	.447	.320	.534	.214	1.670	.004	10
Inter-Item Correlations	.582	.423	.759	.336	1.795	.008	10

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
ready for chemistry a	11.4293	23.911	.663	.573	.930
ready for physics d	11.4343	23.719	.612	.527	.932
ready for chemistry b	11.6212	23.089	.755	.632	.925
ready for chemistry c	11.6869	22.551	.747	.642	.926
ready for chemistry d	11.7020	22.972	.710	.565	.927
ready for chemistry e	11.9040	22.260	.783	.657	.924
ready for physics a	11.7879	22.117	.793	.703	.923
ready for physics b	11.7020	22.403	.769	.641	.924
ready for physics c	11.8838	21.890	.801	.702	.923
ready for physics e	11.6667	22.741	.717	.585	.927

Preparation to teach (Pearth science & environment)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.916	.916	6

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.093	.970	1.273	.303	1.313	.013	6
Item Variances	.507	.453	.557	.104	1.230	.002	6
Inter-Item Correlations	.645	.491	.753	.262	1.533	.007	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
ready for earth science a	5.5354	8.920	.772	.642	.899
ready for earth science b	5.5404	8.920	.786	.677	.897
ready for earth science c	5.5859	8.894	.760	.659	.901
ready for environment a	5.3788	9.292	.745	.627	.903
ready for environment b	5.2828	9.483	.700	.576	.909
ready for environment c	5.4545	8.879	.813	.703	.894

Preparation to teach (Pbiology)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.904	.904	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.474	1.242	1.591	.348	1.280	.018	5
Item Variances	.392	.365	.408	.043	1.118	.000	5
Inter-Item Correlations	.654	.557	.811	.254	1.457	.009	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
ready for biology a	5.8687	4.440	.842	.758	.865
ready for biology b	5.8434	4.610	.792	.679	.876
ready for biology c	5.8586	4.508	.810	.701	.872
ready for biology e	5.7778	4.834	.715	.523	.893
ready for biology d	6.1263	4.862	.649	.438	.907

Professional development

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.747	.746	6

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.519	.348	.687	.338	1.971	.021	6
Item Variances	.233	.216	.249	.033	1.153	.000	6
Inter-Item Correlations	.329	.242	.477	.235	1.973	.006	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
develop content	2.4444	2.695	.506	.293	.705
develop science curriculum	2.5354	2.595	.540	.353	.694
develop science assessment	2.4242	2.824	.424	.198	.727
develop pedagogy/instruction	2.7323	2.634	.528	.296	.698
develop IT	2.7626	2.761	.450	.252	.720
develop inquiry skill	2.6566	2.704	.457	.244	.718

Attitudes toward subject (Inquiry practice)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.576	.575	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.384	3.258	3.490	.232	1.071	.010	4
Item Variances	.377	.344	.434	.090	1.260	.002	4
Inter-Item Correlations	.252	.207	.311	.104	1.504	.001	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
more than 1 representation	10.05	1.698	.356	.128	.505
solving by hypothesis	10.18	1.557	.404	.166	.464
scientific investigation	10.11	1.811	.313	.098	.538
modelling phenomena	10.28	1.755	.358	.133	.504

School setting

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.860	.861	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.338	2.101	2.465	.364	1.173	.042	3
Item Variances	.982	.924	1.051	.127	1.137	.004	3
Inter-Item Correlations	.673	.603	.747	.144	1.239	.004	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
safe neighbourhood	4.5657	3.161	.740	.577	.801
feel safe at school	4.5505	3.162	.792	.633	.751
security policy of school	4.9141	3.531	.679	.471	.855

School climate (High expectation)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.842	.843	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.532	2.192	2.995	.803	1.366	.113	4
Item Variances	1.229	1.162	1.326	.164	1.141	.005	4
Inter-Item Correlations	.572	.435	.712	.277	1.637	.010	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
parent support for student	7.6566	7.831	.650	.518	.813
parent involvement in school	7.9343	7.574	.739	.599	.773
student regard for school	7.6566	7.841	.710	.546	.786
student desire to do well	7.1313	8.368	.612	.447	.827

School climate (Professional teaching force)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.758	.766	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.533	3.237	3.813	.576	1.178	.057	4
Item Variances	1.001	.870	1.137	.267	1.307	.023	4
Inter-Item Correlations	.450	.282	.657	.376	2.335	.015	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
teacher job satisfaction	10.8939	5.811	.458	.229	.757
Teacher understand curriculum	10.5354	5.651	.622	.465	.668
teacher success in curriculum	10.6465	5.387	.698	.535	.627
teacher expectation for student	10.3182	5.721	.475	.281	.748

Content-related activities (Explanation work)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.671	.671	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.784	1.338	2.333	.995	1.743	.178	4
Item Variances	.717	.650	.786	.136	1.210	.003	4
Inter-Item Correlations	.338	.228	.503	.275	2.209	.008	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
technology on society	5.80	3.431	.514	.303	.563
learn nature and inquiry	5.52	3.429	.475	.286	.590
present work	5.29	3.790	.389	.176	.646
relate to daily life	4.80	3.763	.435	.199	.617

Content-related activities (Inquiry work)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.519	.519	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.359	1.298	1.444	.146	1.113	.006	3
Item Variances	.535	.508	.566	.058	1.114	.001	3
Inter-Item Correlations	.265	.251	.275	.025	1.099	.000	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
watch demonstration	2.78	1.301	.344	.118	.401
formulate hypotheses	2.74	1.400	.325	.106	.432
design experiment	2.63	1.361	.331	.110	.423

Factors limiting teaching (Physical resource)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.824	.829	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.957	1.753	2.040	.288	1.164	.013	5
Item Variances	1.233	1.115	1.406	.291	1.261	.013	5
Inter-Item Correlations	.493	.216	.807	.591	3.741	.047	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
limit in other equipment	7.7778	11.290	.778	.709	.743
limit in equipment	7.7424	11.390	.783	.734	.742
limit in physical facility	7.8030	11.205	.741	.653	.752
limit in stu/tch ratio	7.7778	13.798	.328	.133	.873
limit in textbook	8.0303	12.750	.528	.346	.814

Factors limiting teaching (Computer resource)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.948	.948	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.975	1.970	1.985	.015	1.008	.000	3
Item Variances	1.707	1.700	1.715	.015	1.009	.000	3
Inter-Item Correlations	.859	.805	.936	.131	1.163	.004	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
limit in hardware	3.9394	6.281	.908	.878	.911
limit in software	3.9545	6.145	.933	.896	.892
limit in using computer	3.9545	6.612	.834	.704	.967

Factors limiting teaching (Student morale)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.809	.810	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.591	1.545	1.677	.131	1.085	.006	3
Item Variances	.896	.859	.950	.090	1.105	.002	3
Inter-Item Correlations	.587	.505	.673	.168	1.333	.006	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
limit in uninterest	3.0960	2.889	.661	.473	.735
limit in low morale	3.2222	2.722	.722	.531	.671
limit disruptive student	3.2273	2.907	.594	.361	.805

Topic coverage (Ophysics)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.773	.775	10

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.470	.192	.737	.545	3.842	.047	10
Item Variances	.208	.156	.251	.095	1.611	.001	10
Inter-Item Correlations	.257	.064	.609	.545	9.516	.013	10

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
OTL physics a	4.0556	5.494	.491	.343	.746
OTL physics b	4.0202	5.756	.380	.267	.761
OTL physics c	3.9798	5.908	.328	.170	.767
OTL physics g	3.9596	5.887	.350	.183	.764
OTL physics d	4.4293	5.515	.537	.384	.741
OTL physics e	4.5051	5.683	.528	.521	.744
OTL physics f	4.5051	5.835	.441	.435	.754
OTL physics h	4.3384	5.474	.501	.309	.745
OTL physics i	4.1818	5.703	.367	.221	.764
OTL physics j	4.2980	5.479	.484	.290	.747

Topic coverage (Ochemistry)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.742	.742	8

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.548	.364	.773	.409	2.125	.028	8
Item Variances	.225	.177	.244	.067	1.382	.001	8
Inter-Item Correlations	.265	.133	.422	.289	3.171	.008	8

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
OTL chemistry a	3.6111	4.249	.402	.265	.722
OTL chemistry b	3.7273	3.986	.478	.316	.707
OTL chemistry c	3.6818	4.066	.457	.270	.711
OTL chemistry d	3.7172	4.092	.421	.207	.718
OTL chemistry e	3.9697	4.111	.383	.181	.726
OTL chemistry f	3.9899	3.919	.496	.291	.703
OTL chemistry g	3.9697	4.030	.428	.246	.717
OTL chemistry h	4.0202	4.071	.420	.262	.718

Topic coverage (Obiology)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.770	.769	11

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.579	.394	.707	.313	1.795	.014	11
Item Variances	.232	.208	.245	.037	1.175	.000	11
Inter-Item Correlations	.233	.030	.554	.525	18.770	.012	11

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
OTL biology a	5.68	7.266	.415	.272	.753
OTL biology b	5.74	6.933	.527	.369	.739
OTL biology c	5.97	7.207	.401	.331	.754
OTL biology d	5.95	7.211	.397	.250	.755
OTL biology e	5.73	7.245	.401	.269	.754
OTL biology f	5.72	7.115	.457	.283	.748
OTL biology g	5.98	7.076	.458	.290	.747
OTL biology h	5.78	7.369	.335	.194	.762
OTL biology j	5.67	7.462	.337	.243	.761
OTL biology k	5.74	7.118	.450	.388	.748
OTL biology l	5.78	7.138	.430	.364	.751

Topic coverage (Oearth science)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.875	.876	11

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.343	.232	.485	.253	2.087	.004	11
Item Variances	.223	.179	.251	.072	1.400	.000	11
Inter-Item Correlations	.391	.264	.692	.428	2.626	.006	11

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
OTL earth science a	3.4141	9.990	.577	.406	.865
OTL earth science b	3.3939	9.753	.654	.518	.859
OTL earth science c	3.4545	9.995	.595	.409	.863
OTL earth science d	3.2929	9.965	.558	.397	.866
OTL earth science e	3.5455	10.249	.573	.385	.865
OTL earth science f	3.4091	9.989	.575	.397	.865
OTL earth science g	3.4192	10.072	.550	.320	.867
OTL earth science h	3.4242	10.286	.477	.284	.871
OTL earth science i	3.4444	9.944	.609	.408	.863
OTL earth science j	3.4545	9.945	.614	.543	.862
OTL earth science k	3.5253	10.088	.615	.545	.862

Topic coverage (Oenvironment)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.742	.745	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.621	.475	.722	.247	1.521	.017	3
Item Variances	.225	.202	.251	.049	1.243	.001	3
Inter-Item Correlations	.494	.432	.614	.182	1.423	.009	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
OTL environment b	1.1414	.680	.614	.410	.607
OTL environment c	1.1970	.646	.615	.413	.600
OTL environment a	1.3889	.686	.483	.233	.760

Type of homework (Inquiry homework)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.567	.570	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.111	1.035	1.162	.126	1.122	.004	3
Item Variances	.293	.230	.349	.119	1.517	.004	3
Inter-Item Correlations	.307	.180	.380	.200	2.113	.010	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
homework on project	2.20	.880	.335	.147	.528
homework on investigation	2.17	.681	.478	.232	.300
homework on report	2.30	.728	.331	.131	.548

School principal questionnaire

School climate (Professional teaching force)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.750	.754	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.424	3.212	3.641	.429	1.134	.046	3
Item Variances	.631	.576	.726	.150	1.260	.007	3
Inter-Item Correlations	.505	.440	.607	.168	1.381	.006	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
teacher job satisfaction-p	7.0606	1.874	.507	.258	.756
teacher understand goals	6.6313	1.929	.606	.400	.636
teacher degree of success	6.8535	1.872	.629	.419	.608

Parent involvement

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.525	.587	3

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.953	.914	.995	.081	1.088	.002	3
Item Variances	.044	.005	.079	.074	15.619	.001	3
Inter-Item Correlations	.322	.232	.423	.191	1.821	.007	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
parent attend event	1.9091	.093	.461	.226	.199
parent volunteer project	1.9444	.063	.436	.191	.307
parent serve committee	1.8636	.179	.314	.108	.582

Professional development

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.886	.888	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.726	1.268	2.035	.768	1.606	.087	5
Item Variances	1.482	1.340	1.617	.277	1.207	.013	5
Inter-Item Correlations	.613	.467	.831	.364	1.780	.011	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
develop curriculum	6.8384	16.979	.654	.459	.878
develop content knowledge	6.7323	16.705	.783	.720	.849
develop teaching skill	6.5960	16.313	.788	.727	.847
develop school goal	6.9949	16.350	.797	.637	.845
develop ICT	7.3636	17.420	.616	.400	.887

Student behaviour (Bulleyingf)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.846	.851	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.492	1.131	1.682	.551	1.487	.047	5
Item Variances	1.301	.673	1.731	1.058	2.572	.155	5
Inter-Item Correlations	.534	.410	.686	.275	1.670	.007	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
frequency of profanity	5.7778	12.641	.619	.398	.829
frequency of vandalism	5.9394	12.737	.677	.515	.809
frequency of theft	5.9747	12.928	.720	.555	.797
frequency of intimidating student	5.8182	12.992	.715	.545	.799
frequency of injury to student	6.3283	15.684	.585	.402	.837

Student behaviour (Bulleyings)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.814	.816	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	.921	.763	1.066	.303	1.397	.013	5
Item Variances	.489	.385	.600	.215	1.558	.006	5
Inter-Item Correlations	.470	.336	.621	.285	1.849	.007	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
severity of profanity	3.7374	4.783	.577	.345	.786
severity of vandalism	3.5404	4.534	.569	.418	.791
severity of theft	3.6414	4.434	.676	.494	.755
severity of intimidating student	3.6616	4.763	.605	.448	.777
severity of injury to student	3.8434	4.965	.601	.407	.780

Student behaviour (Low morales)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.813	.813	4

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.081	.899	1.253	.354	1.393	.038	4
Item Variances	.465	.421	.518	.097	1.231	.002	4
Inter-Item Correlations	.521	.487	.559	.071	1.146	.001	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
severity of late arrival	3.0707	2.868	.618	.392	.771
severity of absenteeism	3.0758	2.893	.655	.435	.755
severity of skipping	3.4242	2.723	.639	.416	.761
severity of dress code	3.3990	2.891	.614	.380	.772

Instructional resources (Material resource)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.977	.977	11

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.123	1.904	2.283	.379	1.199	.012	11
Item Variances	1.453	1.341	1.545	.204	1.152	.004	11
Inter-Item Correlations	.796	.659	.946	.286	1.434	.004	11

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
shortage of computer for math	21.2374	118.131	.866	.864	.975
shortage of software for math	21.1970	118.555	.866	.869	.975
shortage of calculator for math	21.4495	120.553	.808	.862	.977
shortage of library for math	21.1869	118.112	.899	.871	.974
shortage of AV for math	21.2172	118.140	.912	.896	.974
shortage of computer for science	21.1111	118.353	.898	.907	.974
shortage of software for science	21.0707	118.472	.923	.927	.974
shortage of calculator for science	21.3737	118.611	.857	.898	.976
shortage of library for science	21.1919	118.328	.898	.908	.974
shortage of AV for science	21.2071	117.800	.921	.917	.974
shortage of computer staff	21.2929	118.665	.846	.758	.976

Instructional resources (Facility resource)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.780	.778	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	1.542	1.404	1.727	.323	1.230	.016	5
Item Variances	1.264	.993	1.477	.484	1.487	.051	5
Inter-Item Correlations	.413	.281	.634	.353	2.260	.014	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
shortage of building and ground	6.1616	10.451	.621	.471	.716
shortage of space	6.2677	10.766	.582	.441	.730
shortage of teacher	6.3081	12.874	.411	.181	.782
shortage of material	5.9848	11.660	.584	.410	.731
shortage of budget	6.1263	10.984	.580	.426	.730

Appendix I: Correlation analysis of the Korean data

Student questionnaire

Correlations

		science achievement*
student gender	Pearson Correlation	.092**
	Sig. (2-tailed)	.000
	N	4876
language at home	Pearson Correlation	.004
	Sig. (2-tailed)	.798
	N	4876
books at home	Pearson Correlation	.381**
	Sig. (2-tailed)	.000
	N	4876
mother education	Pearson Correlation	.236**
	Sig. (2-tailed)	.000
	N	4876
father education	Pearson Correlation	.260**
	Sig. (2-tailed)	.000
	N	4876
school level expected by student	Pearson Correlation	.365**
	Sig. (2-tailed)	.000
	N	4876
extra science lesson	Pearson Correlation	.177**
	Sig. (2-tailed)	.000
	N	4876
frequency of homework	Pearson Correlation	-.036*
	Sig. (2-tailed)	.013
	N	4876
time for homework	Pearson Correlation	.045**
	Sig. (2-tailed)	.002
	N	4876
liking science	Pearson Correlation	.407**
	Sig. (2-tailed)	.000
	N	4876
valuing science	Pearson Correlation	.340**
	Sig. (2-tailed)	.000
	N	4876
practical learning	Pearson Correlation	.163**
	Sig. (2-tailed)	.000
	N	4876
STS learning	Pearson Correlation	.198**

	Sig. (2-tailed)	.000
	N	4876
lecture learning	Pearson Correlation	.253**
	Sig. (2-tailed)	.000
	N	4876
liking school	Pearson Correlation	.071**
	Sig. (2-tailed)	.000
	N	4876
school safety	Pearson Correlation	.002
	Sig. (2-tailed)	.878
	N	4876
playing after school	Pearson Correlation	-.226**
	Sig. (2-tailed)	.000
	N	4876
study after school	Pearson Correlation	.272**
	Sig. (2-tailed)	.000
	N	4876
work after school	Pearson Correlation	-.110**
	Sig. (2-tailed)	.000
	N	4876

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Science teacher questionnaire

Correlations

		mean of class achievement
teaching experience	Pearson Correlation	.057
	Sig. (2-tailed)	.362
	N	256
scheduled time/week	Pearson Correlation	.245**
	Sig. (2-tailed)	.004
	N	137
scheduled time/week total	Pearson Correlation	.283**
	Sig. (2-tailed)	.001
	N	137
number of student in class	Pearson Correlation	.315**
	Sig. (2-tailed)	.001
	N	137
ready phy & earth	Pearson Correlation	.066
	Sig. (2-tailed)	.322
	N	225
ready chemistry	Pearson Correlation	.023
	Sig. (2-tailed)	.730
	N	228
ready biology	Pearson Correlation	.072
	Sig. (2-tailed)	.287
	N	220
ready environment	Pearson Correlation	.086
	Sig. (2-tailed)	.198
	N	227
teacher interaction	Pearson Correlation	.193**
	Sig. (2-tailed)	.005
	N	255
professional development	Pearson Correlation	.055
	Sig. (2-tailed)	.378
	N	256
inquiry practice	Pearson Correlation	-.032
	Sig. (2-tailed)	.615
	N	250
knowledge practice	Pearson Correlation	-.060
	Sig. (2-tailed)	.341
	N	253
school environment	Pearson Correlation	.045

	Sig. (2-tailed)	.472
	N	254
high expectation	Pearson Correlation	.285**
	Sig. (2-tailed)	.000
	N	255
professional teaching force	Pearson Correlation	.061
	Sig. (2-tailed)	.333
	N	255
practical work	Pearson Correlation	.032
	Sig. (2-tailed)	.620
	N	248
inquiry work	Pearson Correlation	.077
	Sig. (2-tailed)	.226
	N	251
student resource	Pearson Correlation	-.062
	Sig. (2-tailed)	.325
	N	251
physical resource	Pearson Correlation	-.057
	Sig. (2-tailed)	.371
	N	249
computer resource	Pearson Correlation	-.006
	Sig. (2-tailed)	.924
	N	249
OTLphysics	Pearson Correlation	.003
	Sig. (2-tailed)	.968
	N	235
OTLchemistry	Pearson Correlation	-.049
	Sig. (2-tailed)	.453
	N	239
OTLenvironment	Pearson Correlation	-.071
	Sig. (2-tailed)	.274
	N	237
OTLearthscience	Pearson Correlation	.016
	Sig. (2-tailed)	.806
	N	235
OTLbiology	Pearson Correlation	-.086
	Sig. (2-tailed)	.198
	N	227

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

School principal questionnaire

Correlations

		mean of class achievement
enrolment of all grades	Pearson Correlation	.471**
	Sig. (2-tailed)	.000
	N	137
enrolment of eighth grade	Pearson Correlation	.454**
	Sig. (2-tailed)	.000
	N	136
type of community	Pearson Correlation	.369**
	Sig. (2-tailed)	.000
	N	134
percent of disadvantaged	Pearson Correlation	-.509**
	Sig. (2-tailed)	.000
	N	131
percent of advantaged	Pearson Correlation	.446**
	Sig. (2-tailed)	.000
	N	129
instruction day per year	Pearson Correlation	-.118
	Sig. (2-tailed)	.177
	N	133
total computers in school	Pearson Correlation	.208*
	Sig. (2-tailed)	.019
	N	130
educational ethos	Pearson Correlation	.414**
	Sig. (2-tailed)	.000
	N	137
professional development	Pearson Correlation	.229**
	Sig. (2-tailed)	.007
	N	133
low morale	Pearson Correlation	-.032
	Sig. (2-tailed)	.711
	N	137
frequency of bullying	Pearson Correlation	.172*
	Sig. (2-tailed)	.045
	N	137
frequency of disrespect	Pearson Correlation	.022
	Sig. (2-tailed)	.794
	N	137
severity of low morale	Pearson Correlation	-.015

	Sig. (2-tailed)	.862
	N	135
severity of disrespect	Pearson Correlation	-.153
	Sig. (2-tailed)	.075
	N	136
resource(science)	Pearson Correlation	-.051
	Sig. (2-tailed)	.553
	N	136
resource(math)	Pearson Correlation	-.157
	Sig. (2-tailed)	.071
	N	133
resource(infrastructure)	Pearson Correlation	.056
	Sig. (2-tailed)	.515
	N	136
budget	Pearson Correlation	.003
	Sig. (2-tailed)	.968
	N	135

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix J: Correlation analysis of the South Africa data

Student questionnaire

Correlations

		science achievement *
student age	Pearson Correlation	.318**
	Sig. (2-tailed)	.000
	N	6423
student gender	Pearson Correlation	.013
	Sig. (2-tailed)	.286
	N	6784
language at home	Pearson Correlation	.447**
	Sig. (2-tailed)	.000
	N	6784
books at home	Pearson Correlation	.213**
	Sig. (2-tailed)	.000
	N	6784
extra science lesson	Pearson Correlation	-.377**
	Sig. (2-tailed)	.000
	N	6784
frequency of homework	Pearson Correlation	-.122**
	Sig. (2-tailed)	.000
	N	6784
time for homework	Pearson Correlation	.033**
	Sig. (2-tailed)	.007
	N	6784
student born-in country	Pearson Correlation	.355**
	Sig. (2-tailed)	.000
	N	6784
home possession	Pearson Correlation	.475**
	Sig. (2-tailed)	.000
	N	6784
attitude toward science (enjoying)	Pearson Correlation	.060**
	Sig. (2-tailed)	.000
	N	6784
attitude toward science (self-confidence)	Pearson Correlation	.384**
	Sig. (2-tailed)	.000
	N	6784
attitude toward science (valuing)	Pearson Correlation	-.047**
	Sig. (2-tailed)	.000

	N	6784
learning practice (inquiry-centred)	Pearson Correlation	-.094**
	Sig. (2-tailed)	.000
	N	6784
learning practice (student-centred))	Pearson Correlation	-.081**
	Sig. (2-tailed)	.000
	N	6784
learning practice (lecture-centred)	Pearson Correlation	-.089**
	Sig. (2-tailed)	.000
	N	6784
school climate (liking school)	Pearson Correlation	.044**
	Sig. (2-tailed)	.000
	N	6784
school climate (safety)	Pearson Correlation	.351**
	Sig. (2-tailed)	.000
	N	6784
mass media	Pearson Correlation	-.274**
	Sig. (2-tailed)	.000
	N	6784
study after school	Pearson Correlation	.041**
	Sig. (2-tailed)	.000
	N	6784

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Science teacher questionnaire

Correlations

		mean of class achievement
age of teacher	Pearson Correlation	.324**
	Sig. (2-tailed)	.000
	N	198
teaching experience	Pearson Correlation	.320**
	Sig. (2-tailed)	.000
	N	198
teacher education	Pearson Correlation	.254**
	Sig. (2-tailed)	.000
	N	198
complete first degree	Pearson Correlation	.366**
	Sig. (2-tailed)	.000
	N	198
license type	Pearson Correlation	.298**
	Sig. (2-tailed)	.000
	N	198
scheduled time/week	Pearson Correlation	.210**
	Sig. (2-tailed)	.003
	N	198
science teaching time/ week	Pearson Correlation	-.209**
	Sig. (2-tailed)	.003
	N	198
school facility repair	Pearson Correlation	.535**
	Sig. (2-tailed)	.000
	N	198
number of student in a class	Pearson Correlation	-.282**
	Sig. (2-tailed)	.000
	N	198
textbook use	Pearson Correlation	-.293**
	Sig. (2-tailed)	.000
	N	198
computer in science lesson	Pearson Correlation	.412**
	Sig. (2-tailed)	.000
	N	198
ready to teach physics & chemistry	Pearson Correlation	.156*
	Sig. (2-tailed)	.029
	N	198
ready to teach biology	Pearson Correlation	.043

	Sig. (2-tailed)	.552
	N	198
interaction by discussion or preparation	Pearson Correlation	.001
	Sig. (2-tailed)	.984
	N	198
interaction by visit or observation	Pearson Correlation	-.246**
	Sig. (2-tailed)	.000
	N	198
school climate (safety)	Pearson Correlation	.301**
	Sig. (2-tailed)	.000
	N	198
high expectation (parent & student)	Pearson Correlation	.173*
	Sig. (2-tailed)	.015
	N	198
professional teaching force	Pearson Correlation	.099
	Sig. (2-tailed)	.164
	N	198
STS work	Pearson Correlation	-.262**
	Sig. (2-tailed)	.000
	N	198
practical work	Pearson Correlation	-.150*
	Sig. (2-tailed)	.035
	N	198
physical resource	Pearson Correlation	-.489**
	Sig. (2-tailed)	.000
	N	198
computer resource	Pearson Correlation	-.357**
	Sig. (2-tailed)	.000
	N	198
student resource (SES)	Pearson Correlation	-.230**
	Sig. (2-tailed)	.001
	N	198
OTL for biology	Pearson Correlation	-.172*
	Sig. (2-tailed)	.016
	N	198
inquiry-based homework	Pearson Correlation	-.185**
	Sig. (2-tailed)	.009
	N	198
knowledge-based homework	Pearson Correlation	-.188**
	Sig. (2-tailed)	.008
	N	198
homework for correct, discuss, & grade	Pearson Correlation	.018
	Sig. (2-tailed)	.802

	N	198
homework for monitor & feedback	Pearson Correlation	-.203**
	Sig. (2-tailed)	.004
	N	198

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

School principal questionnaire

Correlations

		mean of class achievement
enrolment of all grades	Pearson Correlation	.301**
	Sig. (2-tailed)	.000
	N	198
enrolment of eighth grade	Pearson Correlation	.222**
	Sig. (2-tailed)	.002
	N	197
type of community	Pearson Correlation	.367**
	Sig. (2-tailed)	.000
	N	198
percent of student still	Pearson Correlation	.295**
	Sig. (2-tailed)	.000
	N	198
percent of absent student	Pearson Correlation	-.197**
	Sig. (2-tailed)	.005
	N	198
percent of 1st language	Pearson Correlation	.609**
	Sig. (2-tailed)	.000
	N	198
percent of disadvantaged	Pearson Correlation	-.616**
	Sig. (2-tailed)	.000
	N	198
percent of advantaged	Pearson Correlation	.553**
	Sig. (2-tailed)	.000
	N	198
principal administrative duty	Pearson Correlation	.324**
	Sig. (2-tailed)	.000
	N	198
principal instruction leadership	Pearson Correlation	-.056
	Sig. (2-tailed)	.431
	N	198
principal supervise & evaluate	Pearson Correlation	-.230**
	Sig. (2-tailed)	.001
	N	198
professional teaching force	Pearson Correlation	.302**
	Sig. (2-tailed)	.000
	N	198
high expectation	Pearson Correlation	.209**

	Sig. (2-tailed)	.000
	N	198
professional development	Pearson Correlation	-.026
	Sig. (2-tailed)	.712
	N	198
frequency of bullying 6	Pearson Correlation	.175*
	Sig. (2-tailed)	.014
	N	198
frequency of low morale	Pearson Correlation	-.062
	Sig. (2-tailed)	.386
	N	198
severity of low morale	Pearson Correlation	-.208
	Sig. (2-tailed)	.003
	N	198
material resource	Pearson Correlation	-.182*
	Sig. (2-tailed)	.010
	N	198
facility resource	Pearson Correlation	-.442**
	Sig. (2-tailed)	.000
	N	198

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix K: Multilevel analysis of the Korean data

The models built as variables added

Fixed effects	Null model	Model-1	Model-2	Model-3	Model-4	Model-5
Student level	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)
Intercept	558.307(1.878)	444.409(4.068)	406.757(4.091)	339.547(5.354)	337.661(5.314)	327.858(5.473)
Liksci		6.847(0.224)	5.947(0.215)	5.223(0.212)	4.945(0.213)	4.936(0.212)
Bokhom			16.477(0.690)	13.982(0.681)	12.862(0.688)	11.960(0.703)
Edustu				21.900(1.182)	20.984(1.178)	19.802(1.190)
Timafsch					5.739(0.663)	5.620(0.661)
Edudad						3.497(0.552)
Extutor						
Class/school level						
Disadva						
Schsize						
Hixpect						
Prodeve						
Random effects						
σ^2_e	4646.078(95.445)	3909.223(80.296)	3529.599(72.508)	3301.747(67.827)	3254.277(66.852)	3241.765(66.597)
σ^2_{u0}	350.446(58.353)	256.107(44.445)	154.426(30.784)	133.741(27.498)	125.767(26.363)	96.072(22.695)
Deviance	*55187.250*	*54331.510*	*53797.330*	*53465.630*	*53391.280*	*53352.730*

Fixed effects	Null model	Model-6	Model-7	Model-8	Model-9	Model-10
Student level	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)
Intercept	558.307(1.878)	329.016(5.459)	344.451(6.101)	336.240(7.006)	325.807(9.262)	319.418(9.634)
Liksci		4.821(0.212)	4.802(0.211)	4.771(0.211)	4.771(0.211)	4.759(0.211)
Bokhom		11.901(0.701)	11.811(0.699)	11.799(0.699)	11.797(0.699)	11.779(0.698)
Edustu		18.901(1.199)	18.883(1.196)	18.998(1.196)	19.002(1.196)	18.993(1.195)
Timafsch		5.715(0.659)	5.687(0.657)	5.678(0.657)	5.680(0.656)	5.683(0.656)
Edudad		3.352(0.551)	3.138(0.549)	2.981(0.553)	2.921(0.554)	2.878(0.554)
Extutor		3.360(0.639)	3.368(0.636)	3.308(0.636)	3.297(0.636)	3.309(0.636)
Class/school level						
Disadva			-6.715(1.149)	-5.992(1.173)	-5.492(1.199)	-5.417(1.181)
Schsize				1.842(0.791)	1.847(0.784)	1.656(0.776)
Hixpect					0.636(0.373)	0.747(0.371)
Prodeve						1.305(0.614)
Random effects						
σ^2_e	4646.078(95.445)	3225.629(66.264)	3225.124(66.249)	3224.321(66.231)	3224.072(66.225)	3223.994(66.223)
σ^2_{u0}	350.446(58.353)	91.298(22.076)	55.313(17.726)	50.917(17.197)	48.339(16.885)	43.997(16.357)
Deviance	*55187.250*	*53325.210*	*53294.430*	*53289.070*	*53286.180*	*53281.750*

The portion of variance explained

Model	Null model		Model-1		Model-2		Model-3		Model-4		Model-5	
Student level		SE		SE		SE		SE		SE		SE
Variance	4646.078	95.445	3909.223	80.296	3529.599	72.508	3301.747	67.827	3254.277	66.852	3241.765	66.597
Explained proportion of variance over null model			15.8%		24.0%		28.9%		30.0%		30.2%	
Explained proportion of variance over last model					8.2%		4.9%		1.1%		0.2%	
Class/school level												
Variance	350.446	58.353	256.107	44.445	154.426	30.784	133.741	27.498	125.767	26.363	96.072	22.695
Explained proportion of variance over null model			26.9%		55.9%		61.8%		64.1%		72.6%	
Explained proportion of variance over last model					29%		5.9%		2.3%		8.5%	

Model	Null model		Model-6		Model-7		Model-8		Model-9		Model-10	
Student level		SE		SE		SE		SE		SE		SE
Variance	4646.078	95.445	3225.629	66.264	3225.124	66.249	3224.321	66.231	3224.072	66.225	3223.994	66.223
Explained proportion of variance over null model			30.6%		30.6%		30.6%		30.6%		30.6%	
Explained proportion of variance over last model			0.4%		0		0		0		0	
Class/school level												
Variance	350.446	58.353	91.298	22.076	55.313	17.726	50.917	17.197	48.339	16.885	43.997	16.357
Explained proportion of variance over null model			73.9%		84.2%		85.5%		86.2%		87.4%	
Explained proportion of variance over last model			1.3%		10.3%		1.3%		0.7%		1.2%	

Appendix L: Multilevel analysis of the South African data

The models built as variables added

Fixed effects	Null model	Model-1	Model-2	Model-3	Model-4	Model-5	Model-6
Student level	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)
Intercept	245.040(7.223)	166.037(7.434)	141.855(7.166)	113.579(7.149)	134.474(7.161)	126.980(7.903)	108.282(6.924)
Selfcon		10.662(0.433)	9.594(0.422)	8.892(0.418)	8.405(0.417)	8.059(0.415)	8.095(0.413)
Boncnty			49.201(2.274)	45.182(2.251)	43.949(2.236)	42.970(2.221)	42.881(2.209)
Agestu				11.668(0.754)	11.422(0.748)	10.850(0.745)	10.968(0.740)
Extutor					-10.880(0.982)	-10.560(0.975)	-10.653(0.969)
Media						7.214(0.700)	6.947(0.697)
Languag							13.931(1.349)
Hompos							
Class/School level							
Safschag							
Disadva							
Phyres							
1stdeg							
Admindt							
Agetch							
Textuse							
Clasize							
STS							
Supevdt							
Lomoral							
Random effects							
$\sigma^2 e$	7034.088(122.582)	6469.732(112.761)	6059.104(105.616)	5860.922(102.134)	5769.945(100.550)	5684.650(99.064)	5626.339(98.047)
$\sigma^2 u_0$	10109.060(1037.217)	8700.362(891.247)	7822.930(800.012)	7196.814(741.657)	6554.918(676.614)	6315.258(652.169)	5262.551(546.429)
Deviance	*80118.130*	*79537.900*	*79085.200*	*78849.910*	*78728.760*	*78623.410*	*78520.400*

Fixed effects	Null model	Model-7	Model-8	Model-9	Model-10	Model-11	Model-12
Student level	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)
Intercept	245.040(7.223)	92.750(7.032)	-107.161(17.096)	118.569(28.581)	133.796(27.141)	122.041(26.600)	106.712(26.507)
Selfcon		8.162(0.412)	8.070(0.412)	8.066(0.412)	8.068(0.411)	8.079(0.411)	8.077(0.411)
Boncnty		43.060(2.204)	42.355(2.199)	42.173(2.192)	41.969(2.190)	42.002(2.188)	41.967(2.187)
Agestu		10.809(0.739)	10.823(0.737)	10.923(0.735)	10.927(0.734)	10.921(0.734)	10.896(0.734)
Extutor		-10.638(0.967)	-10.338(0.967)	-10.212(0.965)	-10.190(0.964)	-10.128(0.964)	-10.111(0.964)
Media		6.360(0.701)	6.305(0.701)	6.416(0.700)	6.413(0.700)	6.428(0.700)	6.426(0.700)
Languag		13.319(1.351)	13.192(1.343)	13.210(1.334)	13.137(1.331)	13.143(1.329)	13.105(1.328)
Hompos		2.805(0.413)	2.774(0.412)	2.785(0.410)	2.778(0.409)	2.813(0.409)	2.777(0.409)
Class/School level							
Safschag			83.491(6.885)	61.662(6.218)	58.295(5.898)	56.146(5.768)	53.592(5.708)
Disadva				-46.179(5.044)	-37.960(5.006)	-36.174(4.892)	-34.713(4.811)
Phyres					-3.860(0.754)	-3.336(0.749)	-3.536(0.736)
1stdeg						26.462(7.938)	22.988(7.853)
Admindt							5.671(1.871)
Agetch							
Textuse							
Clasize							
STS							
Supevdt							
Lomoral							
Random effects							
σ^2_e	7034.088(122.582)	5609.017(97.749)	5608.681(97.761)	5609.134(97.762)	5608.300(97.741)	5608.880(97.752)	5608.495(97.743)
σ^2_{u0}	10109.060(1037.217)	4633.674(482.463)	2549.177(271.669)	1725.937(189.860)	1510.387(168.588)	1415.564(159.003)	1348.337(152.366)
Deviance	*80118.130*	*78475.770*	*78362.880*	*78292.140*	*78267.340*	*78256.530*	*78247.510*

Fixed effects	Null model	Model-13	Model-14	Model-15	Model-16	Model-17	Model-18
Student level	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)	Coefficient(SE)
Intercept	245.040(7.223)	67.710(28.545)	87.230(29.179)	104.684(29.732)	121.482(30.288)	134.433(30.167)	135.674(29.915)
Selfcon		8.077(0.411)	8.080(0.411)	8.097(0.411)	8.112(0.411)	8.110(0.411)	8.102(0.411)
Boncnty		42.079(2.186)	42.102(2.185)	42.038(2.185)	41.983(2.184)	41.859(2.183)	41.934(2.183)
Agestu		10.861(0.734)	10.852(0.733)	10.871(0.733)	10.872(0.733)	10.892(0.733)	10.868(0.733)
Extutor		-10.096(0.964)	-10.077(0.963)	-10.038(0.963)	-10.009(0.963)	-9.984(0.963)	-9.983(0.963)
Media		6.431(0.699)	6.442(0.699)	6.443(0.699)	6.450(0.699)	6.445(0.699)	6.453(0.699)
Languag		13.094(1.326)	13.150(1.325)	13.060(1.325)	12.995(1.325)	12.943(1.324)	13.029(1.323)
Hompos		2.752(0.409)	2.743(0.409)	2.770(0.409)	2.786(0.409)	2.808(0.408)	2.809(0.408)
Class/School level							
Safschag		52.675(5.586)	50.592(5.562)	49.644(5.499)	49.633(5.430)	50.148(5.340)	49.986(5.295)
Disadva		-32.126(4.767)	-30.741(4.725)	-30.612(4.659)	-30.793(4.600)	-28.724(4.583)	-27.896(4.566)
Phyres		-3.520(0.719)	-3.317(0.713)	-3.064(0.710)	-2.802(0.710)	-3.124(0.708)	-3.050(0.703)
1stdeg		21.980(7.679)	22.500(7.564)	20.097(7.527)	17.874(7.494)	18.051(7.361)	16.977(7.322)
Admindt		5.231(1.833)	5.139(1.805)	5.190(1.780)	4.974(1.759)	3.461(1.818)	3.809(1.813)
Agetch		10.815(3.357)	11.808(3.331)	11.247(3.291)	10.885(3.252)	10.625(3.195)	10.891(3.171)
Textuse			-26.628(10.580)	-26.682(10.429)	-24.868(10.324)	-28.697(10.243)	-28.560(10.153)
Clasize				-3.843(1.634)	-3.816(1.613)	-3.128(1.606)	-2.878(1.598)
STS					-2.572(1.133)	-2.251(1.119)	-2.197(1.109)
Supevdt						-7.228(2.719)	-6.592(2.718)
Lomoral							-2.165(1.217)
Random effects							
σ^2_e	7034.088(122.582)	5607.716(97.727)	5607.620(97.724)	5607.814(97.727)	5607.899(97.729)	5608.069(97.732)	5608.399(97.738)
σ^2_{u0}	10109.060(1037.217	1278.829(145.525)	1234.521(141.110)	1194.678(137.114)	1159.314(133.559)	1112.017(128.796)	1089.370(126.504)
Deviance	*80118.130*	*78237.350*	*78231.120*	*78225.660*	*78220.580*	*78213.620*	*78210.480*

The portion of variance explained

Model	Null model	Model-1	Model-2	Model-3	Model-4	Model-5	Model-6
Student level							
Variance	7034.088	6469.732	6059.104	5860.922	5769.945	5684.650	5626.339
Explained proportion of variance over null model		8.0%	13.9%	16.7%	18.0%	19.2%	20.0%
Explained proportion of variance over last model			5.9%	2.8%	1.3%	1.2%	0.8%
Class-school level							
Variance	10109.060	8700.362	7822.930	7196.814	6554.918	6315.258	5262.551
Explained proportion of variance over null model		13.9%	22.6%	28.8%	35.2%	37.5%	47.9%
Explained proportion of variance over last model			8.7%	6.2%	6.4%	2.3%	10.4%

Model	Null model	Model-7	Model-8	Model-9	Model-10	Model-11	Model-12
Student level							
Variance	7034.088	5609.017	5608.681	5609.134	5608.300	5608.880	5608.495
Explained proportion of variance over null model		20.3%	20.3%	20.3%	20.3%	20.3%	20.3%
Explained proportion of variance over last model		0.3%	0	0	0	0	0
Class-school level							
Variance	10109.060	4633.674	2549.177	1725.937	1510.387	1415.564	1348.337
Explained proportion of variance over null model		54.2%	74.8%	82.9%	85.1%	86.0%	86.7%
Explained proportion of variance over last model		6.3%	24%	8.1%	2.2%	0.9%	0.7%

Model	Null model	Model-13	Model-14	Model-15	Model-16	Model-17	Model-18
Student level							
Variance	7034.088	5607.716	5607.620	5607.814	5607.899	5608.069	5608.399
Explained proportion of variance over null model		20.3%	20.3%	20.3%	20.3%	20.3%	20.3%
Explained proportion of variance over last model		0	0	0	0	0	0
Class-school level							
Variance	10109.060	1278.829	1234.521	1194.678	1159.314	1112.017	1089.370
Explained proportion of variance over null model		87.3%	87.8%	88.2%	88.5%	89.0%	89.2%
Explained proportion of variance over last model		0.6%	0.5%	0.4%	0.3%	0.5%	0.2%