INTERNATIONAL TESTING SUB-SCALE DATA COMPARISONS

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TIMSS/07 Trends in International TM4-8 TS4-8 Math & Science Study

- 1995 1999 2003 2007 2011 (Pub. Feb. 2013)
- 2007 – 58 Countries
- Grades 4 & 8 (Age Variable)
- 150+ Schools
- 4,000 – 4,500 Students
- MATH & SCIENCE
- 90+% Percentile Score
- International Benchmarks % Advanced (625) High (550)
- IEA Intl. Assn. for Evaluation of Educational Achievement

- Multiple Choice 50-54%
- Constructed Response 46-50%
- CONTENT & COGNITIVE Domains
- Grade 8 – Math (Includes Algebra)
- GENDER Comparison
- Race/Ethnicity
  Asian, White, Hispanic, Black
- School POVERTY Level
  Related to Achievement
- TRENDS (Cohort 2007 Gr. 4, 2011 Gr. 8)
- TIMSS & PIRLS International Study Center
  Lynch School of Educ. Boston College

http://timss.bc.edu/TIMSS2007/intl_reports.html

PISA

Program for International Student Assessment

2000 Reading 2009
2003 Math 2012
2006 Science 2015

2006 – 57 Countries/ Jurisdictions

30 OECD & 27 Non-OECD Groups
OECD - Organization for Economic Cooperation & Development

- **15 Year-Olds**
- Functional Skills At End of Mandatory Schooling

- APPLICATION of Capabilities to problems with real-life context.
- Scores: Combined & SUB-SCALES
- 90th Percentile Scores
- PROFICIENCY LEVELS 1 – 6
- GENDER Differences
- Race/Ethnicity
- PISA "Effect" Indirect but Influential Tool of Education
- http://www.pisa.oecd.org

CONTENT DOMAINS - TIMSS

MATH

	Gr. 4	Gr. 8
NUMBER	50%	30%
ALGEBRA		30%
GEOMETRY	35%	20%
DATA/PROB.	15%	20%

- **Content Domain %** on test items can be a resource to **BALANCE** distribution in Standards.

SCIENCE

	Gr. 4	Gr. 8
LIFE/BIOL.	45%	35%
CHEMISTRY		20%
PHYSICS	35%	25%
EARTH SCI	20%	20%

- **Content Balance %** outlined in a Country's Curriculum Standards in Grades 4 and 8 may not correlate with **% of Content used in test items.**

TESTING CONTENT Domain

TEST	READING Items	MATH	SCIENCE
PIRLS Grade 4	Literary 64 Informational 62		
TIMSS Grade 4 2011		Number 50% Geom/Meas 35% Data Display 15%	Life Sci. 43% Phys. Sci. 37% Earth Sci. 21%
TIMSS Grade 8 2011		Number 30% Algebra 30% Geometry 20% Data/Chance 20%	Biology 36% Chemistry 20% Physics 26% Earth Sci. 19%
PISA Age 15 2006 Science	READING 2000 **2009**	MATH 2003 **2012**	Living Systems Physical Systems Earth/Space Systems Technology Systems
MAP NWEA Goal Strands	Strategies & Comp. Word Anal. & Vocab. Literature – Elements Literary Works	Number Sense Algebra Geometry/Meas. Data, Stats, Prob.	Life Science Physical Science Earth & Space Science

COGNITIVE DOMAINS & LEARNING

MATH & SCIENCE

- KNOWING (40%)……..
  - Less Facts / More Application
  - Less content / More Process
- APPLYING (40%)……..
  - Concrete / Solve Problems
  - Laboratory / Experiments
- REASONING (20%)…..
  - Complex situations / Explain
  - Describe / Demonstrate
- **BRAIN-BASED**
- **ENGAGED LEARNING**

- **Addresses the facts, procedures, And concepts needed to function Mathematically and scientifically.**
- **Focus on abilities to apply knowledge, and conceptual understanding to solve Problems or answer questions.**
- **Goes beyond cognitive processes involved in solving routine problems to include unfamiliar situations, complex contexts, multi-step problems & more complex tasks.**

More emphasis on higher thinking skills in instruction!

TESTING COGNITIVE Domain

TEST	READING Items	MATH 2011	SCIENCE 2011
PIRLS Grade 4	Literary Mul/Ch . 34 Constructed Res. 30 Information Mult/Ch 30 Constructed Res. 32		
TIMSS Grade 4 2011		Knowing 39% Applying 39% Reasoning 22%	Knowing 40% Applying 40% Reasoning 20%
TIMSS Grade 8 2011		Knowing 38% Applying 41% Reasoning 21%	Knowing 35% Applying 40% Reasoning 25%
PISA Age 15	READING 2000 **2009**	MATH 2003 **2012**	Identifying Sci. Issues Explain Phenomena Use Scientific Evidence
MAP NWEA			

TIMSS INTERNATIONAL BENCHMARKS

MATH 4

NUMBER, GEOMETRY, DATA

- LOW (400) **"DEMONSTRATE"**
- INTERMEDIATE (475) **"EXTEND"**
- **HIGH (550)** **"SOLVE, INTERPRET, USE"**

APPLY knowledge and understanding to solve problems.

- **ADVANCED (625)** **"ORGANIZE"**

APPLY understanding & knowledge in variety of relatively complex situations & explain reasoning.

MATH 8

NUMBER, ALGEBRA, GEOMETRY, DATA

- LOW (400) **" SOME KNOWLEDGE"**
- INTERMEDIATE (475) **"DEMONSTRATE"**
- **HIGH (550)** **"APPLY, WORK, USE, SOLVE"**

APPLY understanding & knowledge in variety of relatively complex situations.

- **ADVANCED (625)** **"APPLY, SOLVE"**

Organize & draw conclusions from information, make generalizations, & SOLVE non-routine problems

SCIENCE - PISA PROFICIENCY LEVELS

PROF LEV	SCORE RANGE	TASK DESCRIPTIONS
1	334.94 – 409.54	☐ Limited Scientific Knowledge applied to few familiar situations. ☐ Able to present obvious scientific explanations from evidence.
2	409.54 – 484.14	☐ Adequate scientific knowledge for possible explanations in familiar context. ☐ Direct reasoning & literal interpretation of scientific inquiry.
3	484.14 – 558.73	☐ Identify clearly described scientific issues in range of contexts. ☐ Select facts & knowledge to explain phenomena & apply simple inquiry strategy. ☐ Interpret, use scientific concepts & apply directly; develop short communications.
4	558.73 – 633.33	☐ Work with situations of explicit phenomena & make scientific inferences. ☐ Select, integrate science explanations and link directly to life situations. ☐ Reflect on actions & communicate decisions using scientific knowledge & evidence.
5	633.33 – 707.93	☐ Identify scientific components of many complex life situations & apply concepts. ☐ Compare, select, evaluate scientific evidence with inquiry ability & critical insight. ☐ Construct evidence-based explanations/arguments based on critical analysis.
6	707.93 +	☐ Consistently identify, explain, apply scientific knowledge in complex life situations. ☐ Link sources, explanations, and use evidence to justify decisions.
		☐ Demonstrate advanced scientific reasoning in support of unfamiliar situations. ☐ Develop arguments for recommendations on personal, social, global situations.

Advanced Achievement Factors

- **Number of Tests** Per Country - 1 to 7
- **Years of Participation** in Testing
- Country Comparisons – Europe 50 – EU 27
- **CONTENT Domain -** Math, Science, Reading
- **COGNITIVE Domain:** Knowing, Applying, Reasoning
- Grade **4**, Grade **8**, Age **15** (Application)
- **Gender**, **90+ Percentile**, **Advanced Benchmarks**
- **Levels of Proficiency (1 – 6)**
- **Trends** over Multiple Years of Testing
- **AVERAGE Variance (Total Scores All Tests)**
- RANK 1-20 **Range**

	TIMMS 4	TIMMS 8	PISA 15
MATH	500- 607	474- 598	492- 549
SCIENCE	504- 587	470- 567	498- 563

TIMSS 4 – MATH HIGHER RANGE THAN SCIENCE
TIMSS 8 - MATH HIGHER RANGE THAN SCIENCE
PISA 15 - SCIENCE HIGHER RANGE

COMPARISON OF TEST SCORES BASED ON AVERAGE OF ALL TESTS GIVEN (7)

NOTE: Many high ranking countries often cited in PISA did not take all the TIMSS tests.

COUNTRIES Rank 1- 20

Combined Test Average

(Rank 1-6) Sig. Higher Avg. – 5/6 Asia

(Rank 9-19) All E or W Europe

Rank	Group	COUNTRY	Test	Avg.
1	AS	Singapore	5	581
2	AS	Hong Kong China	7	559
3	AS	Chinese Taipei	7	558
4	WE	Finland	2	556
5	AS	Korea, Rep. of	4	555
6	AS	Japan	6	549
7	EE	Kazakhstan	2	541
8	ENG	Canada	3	540
9	WE	Netherlands	5	532
10	ENG	England/U.K.	7	527

Rank	Group	COUNTRY	Test	Avg.
11	WE	Belgium	3	526
12 T	WE	Germany	5	524 T
12 T	WE	Liechtenstein	2	524 T
14	EE	Estonia	2	523
15	EE	Russian Federation	7	522
16 T	EE	Hungary	7	521 T
16 T	WE	Switzerland	2	521 T
18 T	EE	Latvia	5	519 T
18 T	WE	Denmark	5	519 T
20	AS	Macao-China	2	518

COUNTRIES Rank 21- 30

Combined 7 Test Average (Incl. PIRLS)

Rank	Group	COUNTRY	Tests	Avg.
21 T	WE	Austria	5	517 T
21 T	ENG	Australia	6	517 T
23	ENG	New Zealand	5	516
24	EE	Slovenia	7	515
25	ENG	United States	7	514
26	WE	Sweden	7	512
27 T	EE	Lithuania	7	511 T
27 T	EE	Czech Rep.	6	511 T
27 T	WE	Luxembourg	3	511 T
30	EE	Slovakia	5	507

LIMITATIONS in Combining Averages

Total Rank covers ALL TESTS Taken.

All Countries did not take all the tests.

TIMSS is MATH & SCIENCE

PIRLS is READING

PISA is SCIENCE and MATH

FINLAND - #1 PISA – NO TIMSS Testing

SINGAPORE - #1 This List – NO PISA

TIED = T Skipped next rank number

List helps to identify a high-scoring sample

MATH & SCIENCE Sample

SELECTION OF COUNTRY GROUPS

	COUNTRY GROUPS (Had At Least One Rank 1-20)	
TIMSS MATH – GR. 4		
TIMSS MATH – GR. 8	ASIA	8
PISA MATH – AGE 15	EASTERN EUROPE	15
TIMSS SCIENCE – GR. 4	WESTERN EUROPE	14
TIMSS SCIENCE – GR. 8	ENGLISH-SPEAKING	7
PISA SCIENCE – AGE 15	MIDDLE EAST	1

MATH TEST COMPARISONS

MATH

CONTINENT		COUNTRY	TIMSS GR 4 MATH 2007	RANK	TIMSS GR 8 MATH 2007	RANK	PISA MATH 2006	RANK	TIMSS 4 MATH 90%	RANK	TIMSS 8 MATH 90%	RANK	PISA MATH 90%	RANK	TIMSS 4 MATH ADV INTL BENCHMARK %	TIMSS 8 MATH ADV INTL BENCHMARK %	TIMSS 4 MATH DIFF GENDER
AS		China HongKong	607	1	572	4	547	3	691	2	681	4	665	2	40	31	M4
AS		China Taipai	576	3	598	1	549	1	663	3	721	1	677	1	24	45	M2
AS		ChinaMacao					525	7					632	14			
AS	G8	Japan	568	4	570	5	523	8	663	3	677	5	638	11	23	26	0
AS		Korea, Rep.			597	2	547	3			711	2	664	3		40	
AS		Malaysia			474	20					578	20				2	
AS		Singapore	599	2	593	3			702	1	706	3			41	40	F6
AS		Thailand			441	29	417	35			562	23	524	36		3	
ASM		Jordan			427	31	384	42			556	24	489	37		1	
EE		Armenia	500	20	499	13			617	13	601	11			8	6	F9
EE		Bulgaria			464	23	413	37			586	18	543	35		4	
EE		Czech Rep.	486	24	504	11	510	13	578	24	599	13	644	8	2	6	M6
EE		Estonia					515	11					618	19			
EE		Hungary	510	15	517	6	491	21	620	11	624	6	609	27	9	10	M3
EE		Kazakhstan	549	5					653	5					19		F8
EE		Latvia	537	8			486	23	628	8			590	32	11		F3
EE		Lithuania	530	10	506	10	486	23	624	10	609	9	602	29	10	6	0
EE		Malta			488	16					597	14				5	
EE		Poland					495	19					610	25			
EE	G8	Russian Fed.	544	6	512	8	476	25	647	6	617	8	592	31	16	8	F7
EE		Serbia			486	18	415	36			587	17	553	34		5	
EE		Slovak Rep.	496	21			492	20	597	19			611	24	5		M6
EE		Slovenia	502	19	501	12	504	16	589	22	594	15	623	17	3	4	M5
EE		Ukraine	469	26	462	25			573	25	572	22			2	3	0

MATH

CONTINENT		COUNTRY	TIMSS GR 4 MATH 2007	RANK	TIMSS GR 8 MATH 2007	RANK	PISA MATH 2006	RANK	TIMSS 4 MATH 90%	RANK	TIMSS 8 MATH 90%	RANK	PISA MATH 90%	RANK	TIMSS 4 MATH ADV INTL BENCHMARK %	TIMSS 8 MATH ADV INTL BENCHMARK %	TIMSS 4 MATH DIFF GENDER
EN		Australia	516	14	496	14	520	10	620	11	600	12	633	13	9	6	M6
EN	G8	Canada					527	6					635	12			
EN		Ireland					501	18					608	28			
EN		New Zealand	492	23			522	9	598	18			643	9	5		M1
EN		Scotland	494	22	487	17			592	20	590	16			4	4	M9
EN	G8	England	541	7	513	7	495	19	647	6	618	7	612	23	16	8	0
EN	G8	U.S.A.	529	11	508	9	474	26	625	9	607	10	593	30	10	6	M6
WE		Austria	505	17			505	15	590	21			630	16	3		M14
WE		Belgium					520	10					650	6			
WE		Denmark	523	13			513	12	611	15			621	18	7		M7
WE		Finland					548	2					652	4			
WE	G8	France					495	19					617	21			
WE	G8	Germany	525	12			504	16	607	16			632	14	6		M12
WE		Iceland					506	14					618	19			
WE	G8	Italy	507	16	480	19	462	29	601	17	574	21	584	33	6	3	M15
WE		Liechtenstein					525	7					643	9			
WE		Luxembourg					490	22					610	25			
WE		Netherlands	535	9			531	4	612	14			645	7	7		M10
WE		Norway	473	25	469	21	490	22	566	26	552	25	609	27	2	0	M7
WE		Sweden	503	18	491	15	502	17	586	23	582	19	617	21	3	2	M6
WE		Switzerland					530	5					652	5			

MATH - ASIA (Rank 1-20)

ASIA All	High Scores, Top Rankings & Percentages
TIMSS 4/8	High: Chinese Taipei, Singapore, Korea Rep, Japan
TIMSS 8	Strongest Evidence – 90% Scores Above 700
TIMSS 8	TIMSS 8 Scores higher than PISA (Gr. 8 Importance)
PISA	Highest: Chinese Taipei, China Hong Kong
PISA	High Rankings Yet PISA scores lower than TIMSS
90%	Highest Scores = Highest 90% + High Adv. Benchmark %

ASIA (AS)	OECD	TM4	RK	TM8	RK	PISA 15	RK	TM4 90%	TM8 90%	PISA 90%	TM4 625	TM8 625
China Hong Kong		607	1	572	4	547	3	691	681	665	40%	31%
China Taipei		576	3	598	1	549	1	663	721	677	24%	45%
China Macao						527	7			632		
JAPAN G8	OECD	568	4	570	5	523	8	663	677	638	23%	26%
Korea, Rep.	OECD			597	2	522	9		711	664		40%
Malaysia				474	20				581			2%
Singapore		599	2	593	3			702	706		41%	40%
Thailand				441	29	421	41		578	524		3%

MATH – ENGLISH LANG. (Rank 1-20)

TIMSS 4 HIGHEST: England/UK 541 USA 529 Gr. 4 Math Highest
TIMSS 8 HIGHEST: England/UK 513 USA 508 (Higher Than PISA)
PISA HIGHEST: Canada 527, New Zealand 522, Australia 520
90% Range (590-647) TIMSS 4 Highest 3/5 PISA Highest 2/5

ENGLISH LANG (ENG)	OE CD	TM4	RK	TM8	RK	PISA 15	RK	TM4 90%	TM8 90%	PISA 90%	TM4 625	TM8 625
Australia PISA Highest	OE CD	516	14	496	14	520	10	620	600	633	9%	6%
Canada Only PISA/High	OE CD					527	6			635		
England/UK Lower PISA	OE CD	541	7	513	7	495	19	647	618	612	16%	8%
Ireland Only PISA	OE CD					501	18			608		
Scotland No PISA	OE CD	494	22	487	17			592	590		4%	4%
New Zealand PISA 90%	OE CD	492	23			522	9	598		643	5%	
U. S. Gr. 4 Higher PISA Low	OE CD	529	11	508	9	474	26	625	607	593	10%	6%

MIDDLE EAST 1-20	OE CD	TM4	RK	TM8	RK	PISA 15	RK	TM4 90%	TM8 90%	PISA 90%	TM4 625	TM8 625
Jordan	No			427	31	384	42		556	489		1%

MATH – W. Europe (Rank 1-20)

TIMSS 4 – 7/14 - Netherlands in top 10 – 5/7 Higher than PISA
TIMSS 8 – Only 3/14 Tested: Italy, Norway, Sweden
PISA 14 - High: Finland, Netherlands, Liechtenstein, Switzerland

W. EUROPE	WE	OECD	TM4	RK	TM8	RK	PISA 15	RK	TM4 90%	TM8 90%	PISA 90%	TM4 625	TM8 625
Austria	Same T4/PISA	OECD	505	17			505	15	590		630	3%	
Belgium	90% Pisa #2	OECD					520	10			650		
Denmark	Similar Rank	OECD	523	13			513	12	611		621	7%	
Finland	HIGH PISA	OECD					548	2			652		
France	Only Pisa	OECD					495	19			617		
Germany	Higher T4	OECD	525	12			504	16	607		632	6%	
Iceland	Only Pisa	OECD					506	14			618		
Italy	Highest T4	OECD	507	16	480	19	462	29	601	574	584	6%	3%
Liechtenstein	#7 PISA	OECD					525	7			643		
Luxembourg	Only Pisa	OECD					490	22			610		
Netherlands	High T4/P	OECD	535	9			531	4	612		645	7%	
Norway	PISA Higher	OECD	473	25	469	21	490	22	566	552	609	2%	>1%
Sweden	Similar T4/Pisa	OECD	503	18	491	15	502	17	586	582	617	3%	2%
Switzerland	90% High	OECD					530	5			652		

MATH – E. EUROPE

(Rank 1-20)

TIMMS 4 Highest (6/10) TIMSS 8 Highest (3/9)
PISA Lowest Score (7/11) Highest Score (1/11)
90% TIMMS 4 (Range 573-653) TIMSS 8 (Range 572-624) PISA (Range 543-644)

EE	OECD	TM4	RK	TM8	RK	PISA 15	RK	TM4 90%	TM8 90%	PISA 90%	TM4 625	TM8 625
Armenia No PISA		500	20	499	13			617	601		9%	6%
Bulgaria T8/Pisa				464	23	413	37		586	543		4%
Czech Rep. 90% High	OECD	486	24	504	11	510	13	578	599	644	2%	6%
Estonia High Pisa						515	11			618		
Hungary High T8	OECD	510	15	517	6	491	21	620	624	609	9%	10%
Kazakhstan High T4		549	5					653			19%	
Latvia High T4		537	8			486	23	628		590	11%	
Lithuania High T4/T8		530	10	506	10	486	23	624	609	602	10%	6%
Malta Only T8				488	16				597			5%
Poland Only Pisa	OECD					495	19			610		
Russian Fed. High T		544	6	512	8	476	25	647	617	592	16%	8%
Serbia Higher T8				486	18	435	32		597	553		5%
Slovak Rep. No T8	OECD	496	21			492	20	597		611	5%	
Slovenia Pisa 90%		502	19	501	12	504	16	589	594	623	3%	4%
Ukraine Even T4/T8		469	26	462	25			573	572		2%	3%

TIMSS MATH – Grade 4 - Rank 1-10

90% Highest Singapore (702) China Hong Kong (691)
Highest Sub-Score: Number (7/10), Geometry (1/10), Data (3/10)
Lowest Sub-Score: Number (2/10), Geometry (5/10), Data (3/10)
Number: (Range 533 - 611) +78 Highest Low & High Score
Geometry: (Range 518 - 599) +81 Lowest Score- Higher Variance
Data: (Range 522 - 585) +63 Mid-Range Distribution
COG DOM Highest Sub-Score: Know 5/10, Apply 5/10, Reasoning 0/10

Rank	COUNTRY	TOT	90 %	NUMB 52%	GEOM 34%	DATA 15%	KNOW 39%	APPLY 41%	REAS 21%
1	China Hong Kong	607	691	606	599	585	599	617	589
2	Singapore	599	702	611	570	583	590	620	578
3	Chinese Taipei	576	663	581	556	567	569	534	566
4	JAPAN G8	568	663	561	566	578	566	565	563
5	Kazakhstan	549	653	556	542	522	547	559	539
6	RUSSIAN Fed G8	544	647	546	538	530	547	538	540
7	ENGLAND G8	541	647	531	548	547	540	544	537
8	Latvia	537	628	536	532	536	540	530	537
9	Netherlands	535	612	535	522	543	540	525	534
10	Lithuania	530	624	533	518	530	539	520	526

TIMSS MATH – Grade 8

Rank 1-10

90% 700+: Chinese Taipei, Korea, Singapore

Highest Sub-Score: Number (1/10), Algebra & Geo. (2/10), Data (5/10)

Number: (Range 506 - 597) + 91 Highest Low Score, Lowest Range

Algebra: (Range 483 - 617) +134 Greatest Range – (Significant)

Geometry: (Range 480 - 592) +112 Greater Range

Data: (Range 487 - 580) + 93 Mid-Range

COG DOM: (Range 486- 596) +110 KNOW 2/10, APPLY 6/10, REAS 2/10

Rank	COUNTRY	TOT	90%	NUM 29%	ALG 30%	GEO 22%	DATA 19%	KNOW 39%	APPLY 41%	REAS 21%
1	Chinese Taipei	598	721	577	617	592	566	592	594	591
2	Korea, Rep.	597	711	583	596	587	580	595	596	579
3	Singapore	593	706	597	579	578	574	593	581	579
4	China Hong Kong	572	681	567	565	570	549	569	574	557
5	Japan	570	677	551	559	573	573	565	560	568
6	Hungary	517	624	517	503	508	524	513	518	513
7	England	513	618	510	492	510	547	514	503	518
8	Russian Fed.	512	617	507	518	510	487	510	521	497
9	Lithuania	508	609	506	483	507	523	511	508	486
10	U.S.A.	506	607	510	501	480	531	503	514	505

PISA MATH - Age 15

Rank 1-20

Asia (5) – English Lang. (5) - W. Europe (11) - E. Europe (5)

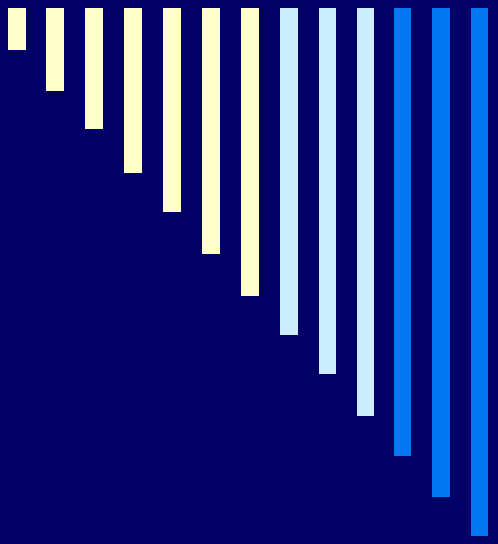
Rank 1-20: RANGE: TOT (492-549) - 90% (608-677) VAR. (+110)

Rank	COUNTRY	TOT	90%	DIF	Rank	COUNTRY	TOT	90%	DIF
1	Chinese Taipei	549	677	128	11	Estonia	515	618	103
2	Finland	548	652	104	12	Denmark	513	621	108
3T	China Hong Kong	547	665	118	13	Czech Republic	510	644	134
3T	Korea, Republic		664	117	14	Iceland	506	618	106
4	Netherlands	531	645	114	15	Austria	505	630	125
5	Switzerland	530	652	122	16T	Germany G8	504	632	128
6	Canada G8	527	635	108	16T	Slovenia	504	623	119
7T	China Macao	525	632	107	17	Sweden	502	617	115
7T	Liechtenstein		643	118	18	Ireland	501	608	107
8	Japan G8	523	638	115	19T	France G8		617	122
9	New Zealand	522	643	121	19T	Poland	495	610	115
10T	Australia	520	633	113	19T	U. K. G8		612	117
10T	Belgium	520	650	130	20	Slovak Republic	492	611	119

90TH PERCENTILE Differences
PISA MATH 2006 - AGE 15
90% = Significant G/T Indicator

- 57 JURISDICTIONS –
  OECD (30) non-OECD (27)
- U.S. – 90th Percentile
  Scored Lower (593) than OECD Average (615)
- U.S. – 90th Percentile
  29/57 Jurisdictions Higher
  (23 OECD) (6 non-OECD)
- U.S. – 10th Percentile
  26/57 Jurisdictions Higher
  (18 OECD) (8 non-OECD)

- 90% Score can be used as DATA to support G/T Programming and Math and Science Advanced Curriculum.
- Increase in 90% Score can be a strong factor in raising the mean score for the country.
- 90% Score comparisons can be used as support for policy for Advanced Math & Science and CONTENT BALANCE in curriculum development.



SCIENCE TEST COMPARISONS

SCIENCE

CONTINENT		COUNTRY	TIMSS GR 4 SCIENCE 2007	RANK	TIMSS GR 8 SCIENCE 2007	RANK	PISA AGE 15 SCIENCE 2006	RANK	TIMSS GR 4 SCIENCE 90TH %	RANK	TIMSS GR 8 SCIENCE 90TH %	RANK	PISA AGE 15 SCIENCE 90TH %	RANK	PISA 15 SCIENCE PROF LEVEL 5-6	RANK
AS		China HongKong	554	3	530	8	542	2	637	7	625	10	655	3	16	3
AS		China Macao					511	15					611	27	5	30
AS		China Taipai	557	2	561	2	532	4	653	2	665	2	651	7	15	4
AS	G8	Japan	548	4	554	3	531	5	633	10	648	4	654	4	15	4
AS		Korea, Rep.			553	4	522	9			646	5	635	16	10	15
AS		Malaysia			471	19					581	22				
AS		Singapore	587	1	567	1			701	1	694	1				
AS		Thailand			471	19	421	41			578	23	524	38	0	38
ASM		Jordan			482	18	422	40			601	16	537	37	1	36
EE		Armenia	484	22	488	15			640	6	612	14				
EE		Bulgaria			470	20			434	27	595	18	577	35	3	35
EE		Czech Rep.	515	18	539	6	513	13	610	19	630	7	641	13	12	11
EE		Estonia					531	5					640	14	11	14
EE		Hungary	536	8	539	6	504	18	637	7	635	6	617	23	7	23
EE		Kazakhstan	533	10					623	14						
EE		Latvia	542	6			490	25	625	13			597	33	4	33
EE		Lithuania	514	19	519	10	488	27	595	23	616	13	604	31	5	30
EE		Malta			457	26					595	18				
EE		Poland					498	20					615	24	7	23
EE	G8	Russian Fed.	546	5	530	8	479	30	646	3	627	9	596	34	5	30
EE		Serbia			470	20	436	36			571	25	548	36	1	36
EE		Slovak Rep	526	13			488	27	627	11			609	29	6	27
EE		Slovenia	518	16	538	7	519	10	610	19	628	8	647	9	13	9
EE		Ukraine	474	24	485	17			576	25	588	21				

SCIENCE

CONTINENT		COUNTRY	TIMSS GR 4 SCIENCE 2007	RANK	TIMSS GR 8 SCIENCE 2007	RANK	PISA AGE 15 SCIENCE 2006	RANK	TIMSS GR 4 SCIENCE 90TH %	RANK	TIMSS GR 8 SCIENCE 90TH %	RANK	PISA AGE 15 SCIENCE 90TH %	RANK	PISA 15 SCIENCE PROF LEVEL 5-6	RANK
EN	G8	Canada					534	3					651	7	14	7
EN		Ireland					508	17					630	19	9	20
EN		New Zealand	504	20			530	6	614	18			667	2	18	2
EN		Scotland	500	21	496	13			593	24	597	17				
EN	G8	U. K.	542	6	542	5	515	12	641	5	649	3	652	6	14	7
EN	G8	U.S.A.	539	7	520	9	489	26	643	4	623	11	628	20	10	15
EN		Australia	527	12	515	11	527	7	626	12	617	12	653	5	15	4
WE		Austria	526	13			511	15	620	16			633	18	10	15
WE		Belgium					510	16					634	17	10	15
WE		Denmark	517	17			496	21	610	19			615	24	7	23
WE		Finland					563	1					673	1	21	1
WE	G8	France					495	22					623	21	8	21
WE	G8	Germany	528	11			516	11	623	14			642	12	12	11
WE		Iceland					491	24					614	26	7	23
WE	G8	Italy	535	9	495	14	475	31	636	9	590	20	598	32	4	33
WE		Liechtenstein					522	9					643	11	12	11
WE		Luxembourg					486	29					609	29	6	27
WE		Netherlands	523	15			525	8	598	22			646	10	13	9
WE		Norway	477	23	487	16	487	28	570	26	578	23	610	28	6	27
WE		Sweden	525	14	511	12	503	19	617	17	608	15	622	22	8	21
WE		Switzerland					512	14					636	15	10	15

SCIENCE - ASIA (Rank 1-20)

TIMSS 4 High Rank: Singapore, Chinese Taipei, China Hong Kong, Japan
TIMSS 8 High Rank: Singapore, Chinese Taipei, Japan, Korea Rep.
PISA High Rank: China Hong Kong, Chinese Taipei, Japan
TIMSS 4/8 Decrease Gr. 4 To Gr. 8 – China Hong Kong (-24), Singapore (- 20)
TIMSS 8/PISA Chinese Taipei (-29), Japan (-33), Korea (-31) - PISA Lowest for All
TIMSS Highest Advanced Benchmark % - Singapore, Chinese Taipei
90% Highest TIM4 ¼ & TIM8 3/7 (Singapore) PISA 2/6 – 625+ Taipei, Singapore

ASIA (AS)	OECD	TS 4	RK	TS 8	RK	PISA SC 15	RK	TS4 90%	TS8 90%	PISA 90%	TS4 625	TS8 625	PISA PL 5/6
China Hong Kong		554	3	530	8	542	2	637	625	655	14%	10%	16%
Chinese Taipei		557	2	561	2	532	4	653	665	651	19%	25%	15%
China Macao						511	15			611			6%
JAPAN G8	OECD	548	4	554	3	531	5	633	648	654	12%	17%	15%
Korea, Rep.	OECD			553	4	522	9		646	635		17%	10%
Malaysia				471	19				581			3%	
Singapore		587	1	567	1			701	694		36%	32%	
Thailand				471	19	421	41		578	524		3%	0%

SCIENCE – ENGLISH LANG (Rank 1-20)

TIMSS 4 – Highest (4/5) Australia, England/UK, Scotland, U.S.A.
TIMSS 8 – Highest (2/5) England/UK, Jordan
TIMSS 8 to PISA – Decline: England/UK (-27), U.S.A. (-34), Jordan (-60)
90% TIMSS 4 Highest: 1/5 U.S.A. Range (593 – 643) +50
90% TIMSS 8 Highest: 2/5 Scotland, Jordan Range (597 – 649) +52
90% PISA Highest: 3/7 Australia, England/UK, New Zealand Range (628 – 667) +39

ENGLISH LANG	OE CD	TS4	RK	TS 8	RK	PISA SC 15	RK	TS4 90%	TS8 90%	PISA 90%	TS4 625	TS8 625	PISA PL 5/6
Australia	OE CD	527	12	515	11	527	7	626	617	653	10%	8%	15%
Canada	OE CD					543	3			651			14%
England/UK	OE CD	542	6	542	5	515	12	641	649	652	14%	17%	14%
Ireland	OE CD					508	17			630			9%
New Zealand	OE CD	504	20			530	6	614		667	8%		18%
Scotland	OE CD	500	21	496	13			593	597		4%	17	
U.S.A.	OE CD	539	7	520	9	489	26	643	623	628	15%	10%	10%
Jordan	NO			482	18	422	40		601	537		5%	

SCIENCE – W. Europe (Rank 1-20)

FINLAND – Rank 1 – PISA Only – Exceptional – (Most PISA Scores Less than TIMMS)
TIMSS 4 Highest Italy (1/7) TIMSS 8 (Limited) Highest Sweden (1/3)
PISA Higher Rank (N=14): Netherlands, Liechtenstein, Germany, Switzerland, Austria
90% - PISA Higher Than TIMSS - 6/7 (TIMSS 4 = 7, TIMSS 8 = 3)

W. EUR. WE	OECD	TS4	RK	TS 8	RK	PISA SC 15	RK	TS4 90%	TS8 90%	PISA SC 90%	TS4 625	TS8 625	PISA PL 5/6
Austria	OECD	526	13			511	15	620		633	9%		10%
Belgium	OECD					510	16			634			10%
Denmark	OECD	517	17			496	21	610		615	7%		7%
Finland	OECD					563	1			673			21%
France G8	OECD					495	22			623			8%
Germany G8	OECD	528	11			516	11	623		642	10%		12%
Iceland	OECD					491	24			614			7%
Italy G8	OECD	535	9	495	14	475	31	636	590	598	13%	4%	4%
Liechtenstein						522	9			643			12%
Luxembourg	OECD					486	29			609			6%
Netherlands	OECD	523	15			525	8	598		646	4%		13%
Norway	OECD	477	23	487	16	487	28	570	578	610	1%	2%	6%
Sweden	OECD	525	14	511	12	503	19	617	608	622	8%	6%	8%
Switzerland	OECD					512	14			636			10%

SCIENCE – E. Europe (Rank 1-20)

TIMSS Highest: Czech Rep., Hungary, Latvia, Russian Fed., Slovenia
BENCHMARK/PL HIGH: (2/3) Czech, Hungary, Russian Fed., Slovenia
PISA – Lower than TIMSS 7/15 – Estonia 5th - 90% High: Czech, Slovenia

EE	OECD	TS4	RK	TS 8	RK	PISA SC 15	R K	TS4 90%	TS8 90%	PISA 90%	TS4 625	TS8 625	PISA PL 5/6
Armenia		484	22	488	15			640	612		12%	8%	
Bulgaria				470	20	434	37	434	595	577		5%	3%
Czech Rep.	OECD	515	18	539	6	513	13	610	630	641	7%	11%	12%
Estonia						531	5			640			11%
Hungary	OECD	536	8	539	6	504	18	637	635	617	13%	13%	7%
Kazakhstan		533	10					623			10%		
Latvia	OECD	542	6			490	25	625		597	10%		4%
Lithuania	OECD	514	19	519	10	488	27	595	616	604	3%	8%	5%
Malta				457	26				595			5%	
Poland	OECD					498	20			615			7%
Russian Fed.	G8	546	5	530	8	479	30	646	627	596	16%	11%	5%
Serbia				470	20	436	36		571	548		2%	1%
Slovak Rep.	OECD	526	13			488	27	627		609	11%		6%
Slovenia		518	16	538	7	519	10	610	628	647	6%	11%	13%
Ukraine		474	24	485	17			576	588		2%	3%	

TIMSS SCIENCE Gr. 4 (Rank 1-10)

LIFE SCI: Singapore High – Italy, Hungary, Taipei, U.S. (3/10) – LOW: Japan,HK, UK
PHYS SCI: Singapore High – Japan, Taipei, HK (6/10) – LOW: Italy, Hungary
EARTH SCI: HIGH: HK, Singapore, Taipei (1/10) – LOW: Japan, Italy, Hungary
COGNITIVE DOMAIN Highest: Knowing 2/10 Apply 4/10 Reasoning 4/10

Rank	COUNTRY	TOT	90%	LIFE 43%	PHYS 37%	EARTH 21%	KNOW 39%	APPLY 41%	REAS 21%
1	Singapore	587	701	582	585	554	579	587	568
2	Chinese Taipei	557	653	541	559	553	556	536	571
3	China Hong Kong	554	637	532	558	560	549	546	561
4	JAPAN G8	548	633	530	564	529	542	528	567
5	RUSSIAN Fed G8	546	646	539	547	536	546	542	542
6 T	ENGLAND G8	542	641	532	543	538	536	543	537
6 T	Latvia	542	625	535	544	536	535	540	551
8	U.S.A. G8	539	643	540	534	533	533	541	535
9	Hungary	536	637	548	529	517	531	540	529
10	ITALY G8	535	636	549	521	526	539	530	526

TIMSS SCIENCE Gr. 8 (Rank 1-10)

HIGHEST: Singapore (90% ++), Chinese Taipei (90% +), Japan, Korea Rep.
BIOLOGY: Singapore Very High, 0/10 Highest Score - Range: 525 – 564
CHEMISTRY: Chinese Taipei Very High, 2/10 Highest Score - Range: 517 – 573
PHYSICS: Singapore, Korea Very High, 6/10 Highest Score – Range: 519 – 575
EARTH SCI: No Extreme High – Range: 525 – 545
COGNITIVE: Highest Score: KNOWING 3/10 APPLYING 2/10 REASONING 5/10

Rank	COUNTRY	TOT	90%	BIO 36%	CHEM 20%	PHYS 26%	EARTH 19%	KNOW 39%	APPLY 41%	REAS 21%
1	Singapore	567	694	564	560	575	541	567	554	564
2	Chinese Taipei	561	665	549	573	554	545	560	565	541
3	JAPAN G8	554	648	553	551	558	533	555	534	560
4	Korea, Rep.	553	646	548	536	571	538	547	543	558
5	England G8	542	649	541	534	545	529	538	530	547
6 T	Czech Repub.	539	630	531	535	537	534	539	533	534
6 T	Hungary	539	635	534	536	541	531	549	524	530
8	Slovenia	538	628	530	539	524	542	533	533	538
9 T	China Hong Kong	530	625	527	517	528	532	522	532	533
9 T	RUSSIAN Fed. G8	530	627	525	535	519	525	527	534	520

PISA SCIENCE Age 15 (Rank 1-25)

HIGHEST 90%: Finland, New Zealand, Hong Kong, Japan, Australia, U.K.,
RANGE: TOT (489 – 563) (+74) 90% (597 – 673) (+76) VAR. Average / 90% (+110)

Rank	COUNTRY	TOT	90%
1	Finland	563	673
2	China Hong Kong	542	655
3	CANADA G8	534	651
4	Chinese Taipei	532	651
5 T	Estonia	531	640
5 T	JAPAN G8		654
7	New Zealand	530	667
8	Australia	527	653
9	Netherlands	525	646
10 T	Korea, Rep.	522	635
10 T	Liechtenstein		643
12	Slovenia	519	647
13	GERMANY G8	516	642

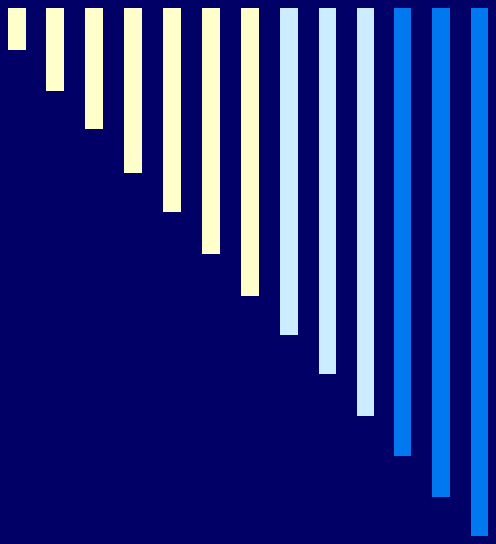
Rank	COUNTRY	TOT	90%
14	ENGLAND/U.K. G8	515	652
15	Czech Republic	513	641
16	Switzerland	512	636
17 T	Austria	511	633
17 T	China Macao	511	611
19	Belgium	510	634
20	Ireland	508	630
21	Hungary	504	617
22	Sweden	503	622
23	Denmark	496	615
24	Latvia	490	597
25	U.S.A. G8	489	628

Note: **TIMSS Advanced Intl Benchmark = 625**

PISA SCIENCE – Sub-Scales

HIGHEST WITHIN COUNTRY:
IDENTIFYING 2/10 EXPLAINING 3/10 USING 5/10

	Combined Science Literacy	Identifying Scientific Issues	Explaining Phenomena Scientifically	Using Scientific Evidence
Finland	563	555	566	567
China Hong Kong	542	528	549	542
CANADA G8	534	532	531	542
Chinese Taipei	532	509	545	532
Estonia	531	516	541	531
JAPAN G8	531	522	527	544
New Zealand	531	536	522	537
Australia	527	535	520	531
Netherlands	525	533	522	526
Liechtenstein	522	522	516	535



GENDER COMPARISONS

GENDER Differences - GRADE 4 TIMSS 2007 – 35 Countries

MATH

- 20/35 Countries -Significant difference in average MATH scores of MALES and FEMALES.
- MALE Higher – 12 Countries
- FEMALE Higher – 8 Countries
- Difference in Average scores - MALE / FEMALE:
  - Kuwait – FEMALE +37
  - Colombia – MALE +17
  - U.S. – MALE +6 (Number Only)

SCIENCE

- 14/35 Countries -Significant difference in average SCIENCE scores of MALES and FEMALES.
- MALE Higher – 8 Countries
- FEMALE Higher – 6 Countries
- Difference in Average scores - MALE / FEMALE:
  - Kuwait – FEMALE +64
  - Colombia – MALE +15
  - U.S. – + MALE – Earth Science

SOURCE: IEA (TIMSS) 2007

GENDER Differences - GRADE 8 TIMSS 2007 – 47 Countries

MATH

- 24/47 Countries – Show significant difference in average MATH scores of MALES and FEMALES.
- MALE Higher – 8 Countries
- FEMALE Higher – 16 Countries
- Difference in Average scores - MALE / FEMALE:
  - Oman – FEMALE +54
  - Colombia – MALE +32
  - U.S. – NO Measurable Difference
    - **MALES Higher in: Number, Geometry, Data & Chance**

SCIENCE

- 24/47 Countries – Show significant difference in average MATH scores of MALES and FEMALES.
- MALE Higher – 10 Countries
- FEMALE Higher – 14 Countries
- Difference in Average scores - MALE / FEMALE:
  - Qatar – FEMALE +70
  - Colombia, Germany – MALE +15
  - U.S. – MALE +12 (Biology, Physics, Earth Science, NOT Chemistry)
    - **MALE: 2003 (536) 2007 (526)**

SOURCE: IEA, (TIMSS) 2007

GENDER Differences
PISA SCIENCE 2006 - AGE 15

- 57 JURISDICTIONS –
  OECD 30 non-OECD 27
- MALE Higher –
  8 Jurisdictions (6 OECD)
  OECD Average
  Higher for MALES
- FEMALE Higher – 12
  Jurisdictions (2 OECD)

- Across OECD –
  FEMALES Higher:
  Identifying Scientific Issues
  Using Scientific Evidence
- Across OECD – MALES Higher:
  Explaining Phenomena Scientifically
- U.S. – FEMALES Higher:
  Identifying Scientific Issues
- U.S. – MALES Higher:
  Explaining Phenomena Scientifically
- U.S. – NO Measurable Difference:
  Using Scientific Evidence

- SOURCE: IES (PISA) 2006

G/T POLICY - Data As Evidence

MATH	SCIENCE
TIMSS 1995 1999 2003 **2007** 2011	**TIMSS** 1995 1999 2003 **2007** 2011
☐ GENDER	☐ GENDER
☐ 90th PERCENTILE	☐ 90th PERCENTILE
☐ ADVANCED INTERNATIONAL BENCHMARKS	☐ ADVANCED INTERNATIONAL BENCHMARKS
☐ CONTENT Domains	☐ CONTENT Domains
☐ COGNITIVE Domains	☐ COGNITIVE Domains
PISA 2000R 2003M 2006S 2009R 2012M	**PISA** 2000R 2003M 2006S 2009R 2012M
☐ **MATH** Sub-Scales 2003, 2012	☐ **SCIENCE** Sub-Scales 2006, 2015
☐ GENDER – (Math Sub-Scales 2003)	☐ GENDER (Science Sub-Scales 2006)
☐ PROFICIENCY LEVELS 1-6	☐ PROFICIENCY LEVELS 1-6

GENDER CONSIDERATIONS

MATH

- Focus on Motivation and Accelerated MATH Opportunities for FEMALES
- Policies to Decrease GENDER variance may increase MATH test scores.
- FEMALE or MALE MATH score differences support evidence for realistic goal of GENDER EQUITY.

SCIENCE

- Focus on Motivation and Advanced SCIENCE Opportunities for FEMALES
- Policies to Decrease GENDER variance may improve total scores in SCIENCE.
- FEMALE or MALE SCIENCE score differences support evidence for realistic goal of GENDER EQUITY.

CONCLUSIONS

- There are a number of **VARIABLES** that can be used in analysis of International Test Scores
- Most comparisons of international test scores relate to **AVERAGE** scores of the country's test sample. Analysis of **Sub-Scores** provides excellent data relating to **ADVANCED** achievement.
- **GENDER** comparisons can provide support for policy and equal opportunity for advanced curriculum for males and females.
- PISA **PROFICIENCY LEVELS 1-6** are useful guides in development of curriculum for advanced students.
- **90 Percentile –** Important data for analyzing achievement of top 10%.
- **CONTENT DOMAIN** sub-scores support CONTENT BALANCE as significant variable related to high achievement in Math, Science and Reading Literacy
- **COGNITIVE DOMAIN** Sub-Scores provide valuable data related to higher order **REASONING**.
- **ADVANCED INTERNATIONAL BENCHMARKS** are an excellent resource for curriculum development for high ability.
- **YEARS OF SCHOOLING & PRE- PRIMARY EDUCATION** are variables related to achievement that support early advanced opportunities. (Includes "Shadow Education.")

I.N.S.T.E.A.D. International

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- *PISA 2006: Science Competencies for Tomorrow's World* (Vols. 1 and 2), http://www.pisa.oecd.org

PISA 2009 – http://www.oecd.org
EXTENSIVE ON-LINE RESOURCES

1. PISA 2009 Results: Executive Summary (21 Pages)

http://www.oecd.org/dataoecd/34/60/46619703.pdf

2. PISA 2009 Results

http://www.oecd.org/document/61/0,3746,en_32252351_32235731_46567613_1_1_1_1,00.html

Volume I – What Students Know and Can Do: Student Performance in Reading, Mathematics And Science, compares the knowledge and skills of students across countries. (272 Pages)

Volume II – Overcoming Social Background: Equity in Learning Opportunities and Outcomes, Looks at how successful education systems moderate the impact of social background and immigrant status on student and school performance. (220 Pages)

Volume III – Learning to Learn: Student Engagement, Strategies and Practices, examines15-year-olds' motivation, their engagement with reading and their use of effective learning strategies. (266 Pages)

Volume IV – What Makes a School Successful? Resources, Policies and Practices, examines how human, financial and material resources, and education policies and practices shape learning outcomes. (304 Pages)

Volume V - Learning Trends: Changes in Student Performance Since 2000, looks at the Progress countries have made in raising student performance and improving Equity in the distribution of learning opportunities. (210 Pages)

PISA at a Glance – Offers a reader-friendly introduction to five of the six volumes of The PISA 2009 results. (99 Pages)

TIMSS INTERNATIONAL BENCHMARKS - MATH (Gonzalez 2008)

BENCHMARK (Cutpoint)	GRADE 4	GRADE 8
ADVANCED (625)	Apply understanding & knowledge in variety of relatively complex situations & explain their reasoning.	Organize & draw conclusions from information, make generalizations, and solve non-routine problems.
HIGH (550)	Apply knowledge & under-standing to solve problems.	Apply understanding & knowledge in a variety of relatively complex situations.
INTERMEDIATE (475)	Apply basic mathematical knowledge in straightforward situations.	Apply basic mathematical knowledge in straightforward situations.
LOW (400)	Have some basic mathematical knowledge.	Have some knowledge of whole numbers & decimals, operations and basic graphs.

PISA PROFICIENCY LEVELS

LEVEL	GENERAL COMPETENCIES AND TASKS - SCIENCE
6	Consistently identify, explain, apply scientific knowledge. Line information sources & explanations & use evidence to justify decisions. Demonstrate advanced scientific thinking & reasoning & use scientific knowledge & develop arguments in support of recommendations.
5	Identify scientific components of many complex life situations & apply scientific concepts. Compare, select, evaluate evidence, use well-developed inquiry abilities, construct evidence-based explanations & arguments based on critical analysis.
4	Work effectively with situations that may require making inferences about role of science or technology. Communicate using sci. evidence.
3	Identify clearly described scientific issues in range of contexts. Interpret & use scientific concepts & apply then directly.
2	Adequate scientific knowledge to provide possible explanations or draw conclusions based on simple investigations.
1	Limited scientific knowledge applied to a few familiar situations.