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National IQs predict educational attainment in math, reading and science across 56 nations

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ABSTRACT

The results of the 2006 PISA (Program for International Student Assessment) study of reading comprehension, mathematical ability, and science understanding administered to 15 year olds in 56 countries [OECD (2007). PISA 2006: Science Competencies for Tomorrow's World. Paris: OECD.] are examined to assess the predictive validity of the national IQs presented by Lynn and Vanhanen [Lynn, R., & Vanhanen, T. (2002). IQ and the wealth of nations. Westport, CT: Praeger., Lynn, R., & Vanhanen, T. (2006). IQ and global inequality. Augusta, GA: Washington Summit Books.], and to assess the contributions of national differences in IQ and educational variables to national differences in educational attainment. It was found that national scores in reading comprehension, mathematical ability, and science understanding are correlated with Lynn & Vanhanen (L & V) national IQs at 0.84; corrected for attenuation, 0.935. This establishes the high validity of Lynn & Vanhanen national IQs. The contribution of national differences in IQ and education variables to national differences in educational attainment obtained in the 2006 PISA 56 nation study showed that the predictive validity of IQ alone was 0.84, and that national IQs together with one economic and two education variables had the validity 0.90 in predicting PISA 2006 results.

1. Introduction

The 2006 PISA (Program for International Student Assessment) study of reading comprehension, mathematical ability, and science understanding administered to 15 year olds in 56 countries (OECD, 2007) is the most recent and largest (in terms of the number of countries participating) of a series of studies of national differences in educational attainment that began in the 1960s (Husen, 1967). The data of this new study are useful for two reasons. First, they make it possible to check the validity of the national IQs presented by Lynn and Vanhanen (2002, 2006) by examining how far these are consistent with the national differences in educational attainment found in the 2006 PISA study. Second, they raise the question of what are the determinants of national differences in educational attainment and whether intelligence may be involved. The objective of this paper is to address these two questions.

The validity of the national IQs for 192 nations presented by Lynn and Vanhanen (2002, 2006) has received a mixed reception. Some critics have taken a negative view of these data, describing them as “highly deficient” (Volken, 2003, p. 411) and “virtually meaningless” (Barnett & Williams, 2004, p.392). Hunt and Sternberg (2006, pp. 133,136) have also written that “the concept of national IQ is meaningless” although Hunt has evidently changed his mind after examining the data further and finding that L & V national IQs are correlated at 0.80 with national scores on math and science, from which he has concluded that “Lynn and Vanhanen's empirical conclusion was correct” (Hunt & Wittman, 2008, p. 1). L & V's empirical conclusion that national IQs are significantly correlated with per capita income could not be correct if their national IQs were meaningless.

Others have taken a positive view of the validity of the L & V national IQs. L and V's (2002, 2006) claim that there is a significant correlation between their national IQs and per capita

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Table 1
Descriptive statistics for national scores in science, math reading comprehension and IQ

PISA 2006	Science	Math	Reading	Total PISA	*d*	PISA EQ	L & V IQ
Argentina	391	381	374	382	−1.21	82	93
Azerbaijan	382	476	353	404	−.99	85	87
Australia	527	520	513	520	.18	103	98
Austria	511	505	490	502	.00	100	100
Belgium	510	520	501	511	.09	101	99
Brazil	390	370	393	384	−1.19	82	87
Bulgaria	434	413	402	416	−.86	87	93
Canada	534	527	527	529	.28	104	99
Chile	438	411	442	431	−.72	89	90
China: Macao	511	525	492	509	.07	101	105
Colombia	388	370	385	381	−1.22	82	84
Croatia	493	467	477	479	−.23	97	90
Czech Republic	513	510	483	502	.00	100	98
Denmark	496	513	494	501	−.01	100	98
Estonia	531	515	501	516	.14	102	99
Finland	563	548	547	553	.51	108	99
France	495	496	488	493	−.09	99	98
Germany	516	504	495	505	.03	100	99
Greece	473	459	460	464	−.38	94	92
Hong Kong	542	547	536	542	.40	106	108
Hungary	504	491	482	492	−.10	99	98
Iceland	491	506	484	494	−.08	99	101
Indonesia	393	391	393	392	−1.11	83	87
Ireland	508	501	517	509	.07	101	92
Israel	454	442	439	445	−.58	91	95
Italy	475	462	469	469	−.34	95	102
Japan	531	523	498	517	.16	102	105
Jordan	422	384	401	402	−1.01	85	84
Korea	522	547	556	542	.40	106	106
Kyrgyzstan	322	311	285	306	−1.98	70	90
Latvia	490	486	479	485	−.17	97	98
Liechtenstein	522	525	510	519	.17	103	100
Lithuania	488	486	470	481	−.21	97	91
Luxembourg	486	490	479	485	−.17	97	100
Mexico	410	406	410	409	−.94	86	88
Montenegro	412	399	392	401	−1.02	85	90
Netherlands	525	531	507	521	.19	103	100
New Zealand	530	522	521	524	.23	103	99
Norway	487	490	484	487	−.15	98	100
Poland	498	495	508	500	−.02	100	99
Portugal	474	466	472	471	−.31	95	95
Qatar	349	318	312	326	−1.77	73	78
Romania	418	415	396	410	−.93	86	94
Russia	479	476	440	465	−.37	94	97
Serbia	436	435	401	424	−.79	88	89
Slovak Republic	488	492	466	482	−.20	97	96
Slovenia	519	504	494	506	.04	101	96
Spain	488	480	461	476	−.26	96	98
Sweden	503	502	507	504	.02	100	99
Switzerland	512	530	499	513	.12	102	101
Taiwan	532	549	496	526	.24	104	105
Thailand	421	417	417	418	−.85	87	91
Tunisia	386	365	380	377	−1.26	81	83
Turkey	424	424	447	432	−.71	89	90
United Kingdom	515	495	495	502	.00	100	100
United States	489	474	–	482	−.21	97	98
Uruguay	428	427	413	422	−.80	88	96
Mean	473	469	460	467	−.35	95	96

income ($r=.62$) has been examined using alternative measures of per capita income and has been confirmed for 81 countries ($r=.82$) by Meisenberg (2004), for 185 countries ($r=.65$) by Whetzel and McDaniel (2006), for 70 countries ($r=.89$) by Jones and Schneider (2006), for 81 countries ($r=.73$) by Dickerson (2006), for 98 non-oil countries ($r=.57$) by Ram (2007), for 152 countries ($r=.76$) by Morse (2008), for 32 countries ($r=.72$) by Hunt and Wittmann (2008), and for 112 countries ($r=.71$) by Gelade (2008). Others have reported that L & V national IQs are significantly correlated with life expectancy (126 nations, $r=0.75$, Kanazawa, 2006; for 98 nations, $r=.51$, Ram, 2007; for 129 nations, $r=.84$, Templer, in press); rates of infant mortality (129 nations, $r=-.84$, Templer, in press); rates of HI/AIDS (129 nations, $r=-.45$, Templer, in press); skin color (129 nations, $r=.91$, Templer, in press); fertility (129 nations, $r=.85$, Templer, in press); HIV infection rates ($r=-.49$, 165 nations, Rindermann & Meisenberg, in press); numbers of patents granted ($r=.51$, 112 nations, Gelade, 2008); and atheism ($r=.60$, 137 nations, Lynn, Harvey, & Nyborg, in press). If the L & V national IQs on which these studies are based are valid, L & V national IQs have explanatory value for a wide variety of economic, sociological, demographic and epidemiological phenomena.

But are the L & V national IQs valid? The first objective of this paper is to address this question by comparing the L & V national IQs with the results of the 2006 PISA study of reading comprehension, mathematical ability, and science understanding administered to 15 year olds in 56 countries (OECD, 2007). This comparison adopts the classical method of examining the validity of intelligence tests by determining whether they are correlated with tests of educational attainment. Thus, "thousands of studies have been published, in numerous languages throughout the world, attempting to demonstrate the validity of intelligence tests against academic performance in school" (Matarazzo, 1972, p. 281). Previous studies have shown that L & V national IQs are positively associated with scores obtained in international data on educational tests (Lynn & Vanhanen, 2002, 2006; Lynn & Mikk, 2007; Rindermann, 2007), but the 2006 PISA study is the most comprehensive in terms of the number of countries sampled than previous studies and provides a more rigorous test of the validity of L & V national IQs.

The second question addressed in this paper concerns the school-based determinants of national differences in educational attainment and whether intelligence may be involved. The 2006 PISA 56 nation study collected data for a number of education variables (e.g. number of lessons/week, interest in learning math and science, ability grouping in schools, etc). The contributions of these for the explanation of national differences in educational attainment obtained in the 2006 PISA 56 nation study has been assessed by educationists without much success. Here we advance the hypothesis that national IQs are the major determinant of differences in educational attainment, but that education variables may have a small additional input in the prediction of PISA test results. There are two bases of our hypothesis that national IQs are the major determinant of

Table 2
Correlation matrix for variables given in Table 1

	Science	Math	Reading	Total PISA	*d*	PISA EQ	L & V IQ
Science	1.00						
Math	.95	1.00					
Reading	.97	.93	1.00				
Total PISA	.99	.98	.98	1.00			
d	.99	.98	.98	1.00	1.00		
PISA EQ	.99	.98	.98	1.00	1.00	1.00	
L & V IQ	.82	.85	.80	.84	.84	.84	1.00

national differences in educational attainment. First, IQ is a major determinant of educational attainment among individuals with correlations typically around 0.5 to 0.7 in numerous studies reviewed in Lynn and Mikk (2007), and sometimes more highly, e.g. at 0.81 in a recent study of 70,000 + English children whose IQs were measured at the age of 11 years and educational attainment was measured at the age of 16 years (Deary, Strand, Smith, & Fernandes, 2007). It can be predicted by extension that IQ is also a major determinant of educational attainment among nations. Second, it has been shown in several studies that there is a strong genetic correlation between cognitive ability measured by tests of intelligence and of

Table 3
Descriptive statistics for students in PISA (2006) countries

Country	Interest in learning science	Support for scientific inquiry	Doing well is important in science	Doing well is important in reading	Doing well is important in math	Awareness of environ-mental issues
Argentina	567	506	85.1	88.3	91.9	−.63
Australia	612	542	88.3	92.3	88.5	−.56
Austria	465	487	72.0	94.5	93.7	.10
Azerbaijan	507	515	65.4	88.5	91.2	.23
Belgium	503	492	64.4	82.2	90.0	−.16
Brazil	592	519	88.4	95.3	93.9	−.26
Bulgaria	523	527	82.6	93.0	91.8	−.10
Canada	469	501	83.4	90.2	95.3	.27
Chile	591	564	89.1	94.3	96.6	−.27
China: Macao	524	521	78.7	93.2	86.1	.06
Colombia	644	546	91.2	94.1	95.5	−.43
Croatia	535	514	63.0	83.8	80.8	.32
Czech Republic	489	485	53.7	88.7	89.3	.07
Denmark	463	483	69.5	96.4	96.8	−.21
Estonia	502	497	81.9	91.9	92.7	.24
Finland	448	479	61.8	79.4	86.0	−.02
France	520	507	64.1	83.4	89.7	−.16
Germany	513	518	75.8	92.2	94.5	.15
Greece	549	533	74.1	79.9	86.2	.09
Hong Kong	536	529	71.5	91.0	92.3	.34
Hungary	522	512	65.9	82.6	83.4	.10
Iceland	466	491	68.0	91.7	97.8	−.39
Indonesia	608	521	89.9	95.8	96.3	−1.09
Ireland	481	484	74.8	92.9	95.8	.38
Israel	509	512	68.4	84.7	93.1	−.66
Italy	529	511	81.9	92.8	90.5	.18
Japan	512	468	68.0	88.0	87.2	−.13
Jordan	609	555	93.0	87.3	89.9	−.04
Korea. South	486	495	75.2	92.4	87.8	−.22
Kyrgyzstan	580	502	90.2	94.0	93.5	−.45
Latvia	504	494	71.4	91.1	94.0	−.02
Liechtenstein	504	524	64.8	87.3	92.7	.01
Lithuania	544	541	84.0	93.6	93.9	−.02
Luxembourg	515	522	66.8	86.1	84.8	−.26
Mexico	611	536	88.8	96.3	97.4	−.45
Montenegro	561	529	76.5	86.6	76.3	.03
Netherlands	452	447	72.5	86.5	89.5	−.08
New Zealand	461	470	75.6	93.2	95.1	−.12
Norway	472	485	77.4	83.8	91.0	.06
Poland	501	513	77.1	88.4	86.4	.37
Portugal	571	538	83.0	87.9	89.9	.12
Qatar	565	520	82.9	76.6	81.4	−.72
Romania	591	540	78.0	93.2	89.7	−.37
Russia	541	508	75.3	92.6	91.9	.18
Serbia	523	520	65.1	85.1	75.2	.02
Slovakia	522	497	60.5	91.1	87.7	.15
Slovenia	505	502	71.9	87.0	89.0	.30
Spain	534	529	73.6	84.4	88.8	.06
Sweden	454	471	72.9	94.1	94.9	−.24
Switzerland	504	510	62.0	90.1	92.3	−.22
Taiwan	533	546	77.6	87.9	83.4	.46
Thailand	642	569	97.4	95.8	98.1	−.20
Tunisia	590	534	89.9	74.3	85.6	−.73
Turkey	540	563	80.7	93.6	93.0	.07
United Kingdom	464	470	83.6	95.3	96.1	.25
United States	480	490	82.3	89.7	93.9	.01
Uruguay	567	510	83.1	84.4	92.0	−.34

educational attainment, i.e. the same genes determine ability measured in both kinds of test (Bartels, Rietveld, van Baal, & Bloomsma, 2002; Kovas, Harlaar, Petrill, & Plomin, 2005; Petrill & Wilkerson, 2000). Kovas et al. (2005), designate these "generalist genes" because they determine many expressions of cognitive ability including IQs, math, reading, science, etc. The frequency of these generalist genes in different populations should produce positive correlations among measures of cognitive ability across nations.

2. Method

The 2006 PISA (Program for International Student Assessment) study administered tests of reading comprehension,

Table 4
Descriptive statistics for schools in PISA (2006) countries

Country	Ability grouping for all subjects	A minority of parents has pressure at school	Information is given relative to other students	Math regular lessons less than 2 in a week	Parents completed ISCED Level 3A and/or Level 4
Argentina	22.4	33.8	65.0	34.7	12.0
Australia	16.5	49.3	97.7	26.9	11.0
Austria	4.9	52.8	59.4	8.8	12.0
Azerbaijan	4.1	30.2	28.5	17.9	12.5
Belgium	22.2	33.1	35.1	22.1	12.0
Brazil	43.4	49.2	84.9	30.0	11.0
Bulgaria	12.1	55.5	81.2	33.5	12.0
Canada	14.8	50.2	79.3	15.2	12.0
Chile	19.3	52.2	73.0	32.0	12.0
China: Macao	13.4	54.4	38.9	6.8	12.0
Colombia	42.4	38.4	87.9	13.8	11.0
Croatia	26.7	39.6	60.0	21.5	12.0
Czech Republic	11.8	60.3	65.7	10.0	13.0
Denmark	7.2	40.8	31.4	4.0	12.0
Estonia	14.8	52.3	40.6	13.4	12.0
Finland	2.1	19.7	15.4	10.7	12.0
France	–	–	–	10.9	12.0
Germany	10.5	52.4	67.8	11.1	13.0
Greece	0.6	20.7	70.5	18.6	12.0
Hong Kong	17.3	73.4	85.6	7.7	13.0
Hungary	2.2	49.0	70.8	22.1	12.0
Iceland	6.2	37.8	41.4	4.8	14.0
Indonesia	64.3	60.4	97.8	14.4	12.0
Ireland	7.4	47.1	38.9	13.5	12.0
Israel	19.5	38.2	55.1	16.7	12.0
Italy	21.8	56.0	18.8	17.3	13.0
Japan	9.8	49.3	40.2	8.3	12.0
Jordan	31.0	52.2	91.0	33.4	12.0
Korea. South	6.8	65.2	84.1	4.5	12.0
Kyrgyzstan	15.0	52.8	90.7	44.2	10.0
Latvia	17.1	31.4	31.9	8.1	11.0
Liechtenstein	–	–	–	14.2	13.0
Lithuania	8.6	54.6	56.7	23.1	11.0
Luxembourg	46.1	43.6	78.3	13.5	13.0
Mexico	29.3	40.7	87.7	26.0	12.0
Montenegro	61.5	63.2	82.6	35.4	12.0
Netherlands	48.3	45.8	35.4	23.6	12.0
New Zealand	5.8	49.4	49.9	8.8	12.0
Norway	2.9	52.1	39.2	12.9	12.0
Poland	3.3	50.2	78.7	13.1	12.0
Portugal	13.7	68.8	47.3	19.6	12.0
Qatar	50.5	38.2	89.0	38.2	12.0
Romania	28.6	27.4	94.8	32.0	12.5
Russia	40.4	61.6	90.6	19.0	12.0
Serbia	34.7	53.1	92.1	19.9	12.0
Slovakia	15.5	63.0	94.3	20.6	12.0
Slovenia	3.5	43.4	27.5	22.1	12.0
Spain	15.2	31.0	50.0	12.9	12.0
Sweden	5.5	56.6	12.0	11.6	12.0
Switzerland	40.1	53.1	49.1	13.6	12.5
Taiwan	8.2	66.4	66.4	17.3	12.0
Thailand	50.2	40.9	83.3	5.4	12.0
Tunisia	77.5	37.1	73.7	29.3	13.0
Turkey	18.6	46.8	88.1	19.7	11.0
United Kingdom	8.1	50.6	54.7	7.7	13.0
United States	7.4	48.5	65.9	27.4	12.0
Uruguay	17.2	36.6	47.9	23.7	12.0

mathematical ability, and science understanding to representative samples of 15 year olds in 56 countries (OECD, 2007). More than 400,000 students participated in the study and the results are available at the OECD web site (PISA, 2006). We have averaged these scores and expressed these averages in standard deviation unit deviations from the British mean (502, SD = 99). These figures have then been converted to conventional IQs by multiplying them by 15. We call these "PISA EQs" (educational quotients). These PISA EQs are therefore expressed in the same metric as the national IQs presented in Lynn and Vanhanen (2006) in which national IQs are calculated in relation to a British mean of 100 and SD of 15. This makes PISA national EQs directly comparable with the L and V (2006) national IQs.

There is a PISA EQ for Liechtenstein, for which Lynn and Vanhanen (2006) do not give an IQ because its population was below the cut-off of 40,000. For the purpose of the present analysis Liechtenstein is credited with an IQ of 100 because it is situated between Austria (100) and Switzerland (101), following the procedure adopted in Lynn and Vanhanen (2006) for estimating missing IQs from the measured IQs of neighbouring countries. PISA EQs for the Peoples' Republic of China were obtained from two samples, namely from Macao and Hong Kong.

The 2006 PISA study included besides tests also questionnaires to all students, school representatives (vice-principals), and parents. Students were asked about motivation and related aspects of learning science. For example, the students were asked to express their interest in learning different science subjects according to a four stage scale: high interest, medium interest, low interest, no interest. The summary index of interest in learning science topics was derived from these answers. Another example, the index of students' awareness of environmental issues was calculated from students' information about some environmental topics (greenhouse gases, nuclear waste etc.). School principals were asked about learning environment in school, for example, ability grouping—whether students were grouped into different classes, or into groups in a class in some subjects or in all subjects. Parents were asked about their interest in science issues and their opinion about school quality but these answers were not included into our analysis.

3. Results

Descriptive statistics for the 2006 PISA scores of 15 year olds on reading comprehension, mathematics and science understanding are given in Table 1, columns 2, 3 and 4. Column 5 gives the average of these three scores (Total PISA). Column 6 gives these averages expressed in standard deviation unit deviations (d) from the British mean (502, SD = 99). Column 7 expresses these averages (ds) as EQs in relation to a British mean of 100 (SD 15). Column 8 gives the Lynn and Vanhanen (2006) national IQs.

The inter-correlations between the variables are given in Table 2. All the correlations are high and statistically significant at the 0.01 level. The correlation between the PISA national EQs and the L & V national IQs is 0.84. To correct this figure for attenuation, the reliability of the L and V (2006) national IQs is taken as 0.92 based on the test–retest correlation for 71 countries, given by Lynn and Vanhanen (2006, p. 62). The reliability of the PISA national EQs is taken as 0.95, the average of the correlations between reading comprehension, mathematics and science understanding. The attenuation corrected correlation between L & V national IQs and PISA national EQs is 0.935.

Table 3 gives descriptive statistics for students in PISA 2006 countries such as interest in learning science, the importance of doing well in science, support for scientific inquiry etc. Table 4 includes data about schools in the countries: math regular lessons less than 2 in a week, ability grouping of students, parental expectations for high academic standards, school accountability to parents, and levels of parental education converted into years of schooling.

Table 5 gives the correlations between L & V national IQs and the variables given in Tables 3 and 4. We see in the table that L & V national IQs have the highest correlation .84 with PISA 2006 test results. The next highest correlation has interest in Science −.69 (the value of the coefficient is negative because higher levels of interest and other motivational variables in Table 5 were coded by smaller numbers; so

Table 5
Correlations between L & V national IQs, PISA (2006) average and the variables given in Tables 3 and 4

	PISA 2006 average
IQ L&V	.84
Interest in science	−.69
Support for scientific inquiry	−.45
Doing well is important science	−.54
Awareness of environmental issues	.55
Ability grouping of students for all subjects %	−.54
A minority of parents has pressure at school %	.20
Parents have information relative to other students in the school	−.48
Math regular lessons less than 2 in a week	−.69
Parents completed ISCED Level 3A and/or Level 4	.31

Table 6
Elaboration of the PISA (2006) prediction model

Model	*R*	*R* square	*R* square change	*F* change	df	Sig. *F* change
1	.838(a)	.703	.703	122.8	52	.000
2	.869(b)	.755	.052	10.8	51	.002
3	.891(c)	.795	.040	9.8	50	.003
4	.902(d)	.813	.018	4.8	49	.033

(a) Predictors: (constant), IQ L&V.
(b) Predictors: (constant), IQ L&V, math regular lessons <2 in a week.
(c) Predictors: (constant), IQ L&V, math regular lessons <2 in a week, awareness of environmental issues.
(d) Predictors: (constant), IQ L&V, math regular lessons <2 in a week, awareness of environmental issues, interest in science.

Table 7
The best fit PISA (2006) prediction model

Predictor	Unstandardized coefficients B	Standardized coefficients β	*t*	Predictor importance βr
(Constant)	172.88		1.60	
IQ L&V	4.51	.50	5.63	.42
Math regular lessons less than two in a week	−1.40	−.24	−2.97	.17
Awareness of environmental issues	32.05	.18	2.58	.10
Interest in science	−.20	−.18	−2.19	.12

the correlation reveals positive impact of interest on science scores). A high correlation with PISA 2006 science score had also Math regular lessons less than 2 in a week −.69.

We have conducted a regression analysis to find the independent input of these variables on PISA scores. The results of the analysis are given in Tables 6 and 7. In Table 6, the most important predictor L & V IQ was entered in the model first. There is statistically significant prediction validity also for math regular lessons less than 2 in a week, awareness of environmental issues, and interest in science. The relative importance of these predictors is given in Table 7 under predictor importance. We see that the most important predictor of PISA scores is the L & V National IQs, Math regular lesson less than 2 in a week is in second place, and two motivational variables are also in the model. Absolute value of t coefficient can also be seen as an indicator of predictor importance (Johnson & Lebreton, 2004, 244). The indicator reveals also the highest importance of IQ L&V in predicting PISA 2006 scores.

4. Discussion

This paper had two objectives. First, to examine the validity of the L & V national IQs by comparing them with the results of the 2006 PISA (Program for International Student Assessment) study of reading comprehension, mathematical ability, and science understanding administered to 15 year olds in 56 countries (OECD, 2007). If the L & V national IQs are valid, they should be highly correlated with these tests of educational attainment, just as at the individual level there are high correlations between IQ tests and educational attainment tests. The results given in Table 2 show that the L & V national IQs are highly correlated with all three of the educational tests (science, $r=0$ .82; math, $r=0.85$; reading comprehension, $r=.$ 0.80), and with the average of the three of the educational tests at $r=0.84$, corrected for attenuation, $r=0.935$). We believe that these high correlations establish beyond reasonable dispute that the L & V national IQs have a high degree of validity and refute the assertions that they are “meaningless” as contended by Barnett and Williams (2004, p.392) and Hunt and Sternberg (2006, p. 136).

The second question addressed in this paper is to examine the relative contributions of L & V national IQs and of educational variables for the explanation of national differences in educational attainment obtained in the 2006 PISA 56 nation study. The correlation of 0.935 between national IQs and educational attainment in science, math, and reading comprehension across the 56 nations shows that national IQs explain 87.4% of the variance in educational attainment. The multiple regression given in Tables 6 and 7 shows that the educational variables raised the prediction validity of the 2006 PISA scores from .84 to .90. Math regular lessons less than 2 in a week, awareness of environmental issues, and interest in science also had some validity in predicting PISA 2006 scores.

It should be noted that most of the countries for which IQs and EQs are given in this paper are economically developed, and there are no counties from sub-Saharan Africa. This involves some restriction of range in the present data set. Other studies have shown that there is a strong association between national IQs and EQs when more economically developing countries are included (Lynn & Mikk, 2007; Rindermann, 2007).

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