PIRLS: International achievement in the processes of reading comprehension : results from PIRLS 2001 in 35 countries

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International Achievement in the Processes of Reading Comprehension

Results from PIRLS 2001 in 35 Countries

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Michael O. Martin
Eugenio J. Gonzalez

IEA
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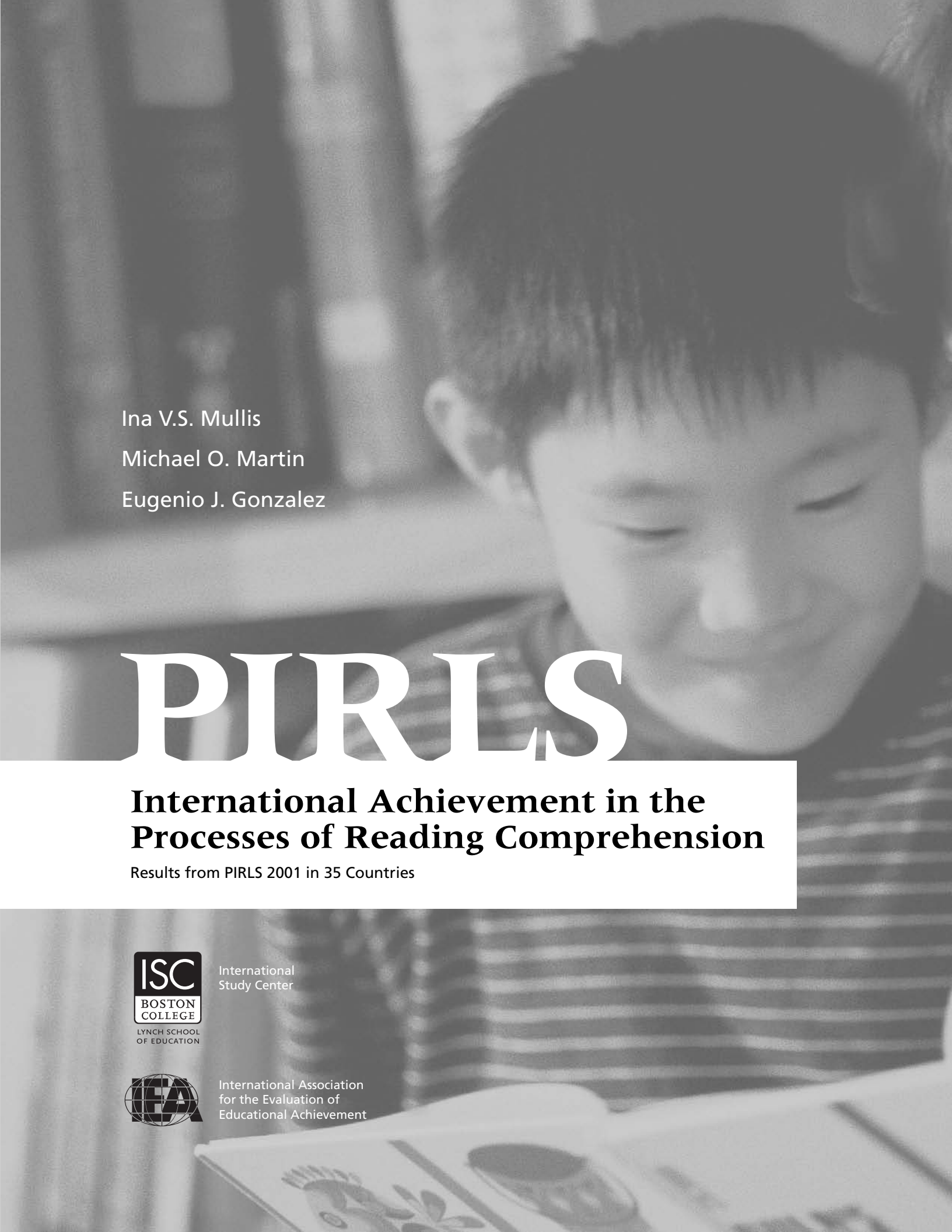

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International Study Center

International Association for the Evaluation of Educational Achievement

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International Achievement in the Processes of Reading Comprehension

Introduction

PIRLS (Progress in International Reading Literacy Study) is IEA's newly-developed assessment of students' reading achievement at fourth grade. Designed to provide trends in reading achievement on a regular five-year cycle, PIRLS 2001 has been completed with 35 countries participating and development of PIRLS 2006 is well underway. As described in the PIRLS 2001 Framework (Campbell, Kelly, Mullis, Martin, & Sainsbury, 2001), purposes for reading and processes of comprehension formed the foundation for the PIRLS 2001 written assessment with students' attitudes and reading habits addressed through questionnaires. More than half of the questions were in the constructed-response format, requiring students to generate and write their answers.

The achievement results from the initial assessment as well as considerable information from home, student, teacher, and school questionnaires were reported in the *PIRLS 2001 International Report* (Mullis, Martin, Gonzalez, & Kennedy, 2003). PIRLS 2001 assessed two major reading purposes – literary and informational. Within the two major reading purposes,

PIRLS assessed a range of four reading comprehension strategies. Because PIRLS is a curriculum-based study conducted with the aim of improving reading education and achievement, it was the intention from the inception of the study to report results for the two major types of reading students do in school. Indeed, on average across the participating countries, teachers reported that 84% of the students were asked to read fiction (literary) at least weekly, including such genres as fables and fairy tales, stories, books, poems, and plays. Also, 56% were asked to read non-fiction (informational) at least weekly, including such materials as descriptions of and explanation about things, people, or events; instructions or manuals about how things work; and charts, diagrams, and graphs.

In accordance with the study design based half on literary and half on informational reading materials, the *PIRLS 2001 International Report* contained achievement scales for reading literacy overall and for the two major purposes for reading. In planning PIRLS 2006, however, it seemed desirable to enhance the study by providing achievement results for the comprehension processes as well. To begin researching this possibility, the PIRLS International Study Center at Boston College undertook the project of scaling the PIRLS 2001 results by the comprehension processes. This paper describes our experience and presents the results of scaling the PIRLS 2001 reading comprehension processes for the 35 countries.

The four processes specified in the *PIRLS 2001 Framework* include:

- Focus on and retrieve explicitly stated information
- Make straightforward inferences
- Interpret and integrate ideas and information
- Examine and evaluate content, language, and textual elements

Since improving the assessment by providing information on comprehension processes in addition to reading purposes is an important goal of PIRLS 2006, the PIRLS International Study Center began by researching the possibility of scaling the 2001 data by all four of the reading processes speci-

fied in the framework. To complete the scaling, however, it was necessary to combine the processes into just two scales – one for the first two processes and one for the second two processes.

As documented in the *PIRLS 2001 Technical Repor*t (Martin, Mullis, & Kennedy, 2003), all aspects of PIRLS were conducted with concerted attention to quality. Countries met rigorous standards for sampling designed to prevent bias and ensure comparability. Translating the tests and questionnaires involved a detailed iterative review process, and numerous training sessions were held in data-collection and scoring procedures. Prior to analysis, each country's data were subjected to exhaustive checks for consistency and comparability across countries.

To place country achievement for the PIRLS 2001 comprehension processes in context, the findings previously reported for the overall scale and the reading purposes are summarized in the next two sections.

Summary of Overall Achievement in Reading Literacy for the PIRLS Countries

To recap the achievement results for reading literacy overall, Exhibit 1 presents the 35 countries that participated in PIRLS 2001 in decreasing order of average (mean) scale score, together with an indication of whether the country average was significantly higher or lower than the international average. (The international average of 500 is the mean of the average scale score of each of the participating countries.)

As shown in the left-hand portion of Exhibit 1, Sweden had the highest reading literacy achievement of all the countries participating in PIRLS 2001. Analyses to determine whether the differences in average achievement between pairs of countries were statistically significant indicated that The Netherlands, England, and Bulgaria were outperformed only by Sweden. Latvia, Canada, Lithuania, Hungary, the United States, Germany, and Italy also performed better than most of the other countries.

PIRLS devoted considerable effort to maximizing comparability across the grades and ages tested, but it is difficult given that students start formal schooling at different ages. More information may be found in the *PIRLS 2001 Encyclopedia* (Mullis, Martin, Kennedy, & Flaherty, 2002), which describes educational systems and reading literacy curricula in the PIRLS countries. Exhibit 1 shows that the grade tested in most countries represented the fourth year of formal schooling. Thus, solely for convenience, the grade tested is called the fourth grade. On average, students in most countries were 10 years old (aged from 10.0 to 10.9 years). Students in eight countries were younger (from 9.7 to 9.9 years); in Latvia, Romania, and Morocco, students were older (from 11.0 to 11.2 years).

The right-hand portion of Exhibit 1 presents the achievement results by gender. As can be seen, fourth-grade girls had significantly higher reading achievement than boys in all countries.

Summary of Achievement in Reading for Literary and Informational Purposes

The *PIRLS 2001 International Report* also presented results for the two overarching purposes for reading assessed by PIRLS:

- Reading for literary experience, and
- Reading to acquire and use information.

Essentially, the PIRLS assessment was designed so that half the passages, time, and questions tested reading for literary purposes and half tested for informational purposes. In literary reading, the reader becomes involved in imagined events, settings, actions, consequences, characters, atmospheres, feelings, and ideas; bringing his or her own experiences, feelings, appreciation of languages, and knowledge of literary forms to the text. In reading for information, the reader engages not with imagined worlds, but with aspects of the real universe. Through informational texts, one can understand how the world is and has been, and why things work as they do. These texts take many forms, but one major distinction is between chronological and non-chronological organization.

Exhibit 1: Distribution of Reading Achievement Overall and by Gender

PIRLS

Countries	Overall Average Scale Score	Years of Formal Schooling	Average Age	Girls Average Scale Score	Boys Average Scale Score	Achievement Difference
Sweden	▲ 561 (2.2)	4	10.8	572 (2.6) ▲	550 (2.5)	22 (2.6)
Netherlands	▲ 554 (2.5)	4	10.3	562 (2.7) ▲	547 (2.8)	15 (2.2)
England	▲ 553 (3.4)	5	10.2	564 (3.9) ▲	541 (3.7)	22 (3.3)
Bulgaria	▲ 550 (3.8)	4	10.9	562 (3.7) ▲	538 (4.7)	24 (3.6)
Latvia	▲ 545 (2.3)	4	11.0	556 (3.1) ▲	534 (2.6)	22 (3.4)
[1] Canada (O,Q)	▲ 544 (2.4)	4	10.0	553 (2.6) ▲	536 (2.6)	17 (2.1)
[1] Lithuania	▲ 543 (2.6)	4	10.9	552 (3.0) ▲	535 (2.7)	17 (2.7)
Hungary	▲ 543 (2.2)	4	10.7	550 (2.4) ▲	536 (2.5)	14 (2.1)
United States	▲ 542 (3.8)	4	10.2	551 (3.8) ▲	533 (4.9)	18 (4.1)
Italy	▲ 541 (2.4)	4	9.8	545 (2.6) ▲	537 (2.7)	8 (2.5)
Germany	▲ 539 (1.9)	4	10.5	545 (2.2) ▲	533 (2.5)	13 (2.7)
Czech Republic	▲ 537 (2.3)	4	10.5	543 (2.8) ▲	531 (2.6)	12 (2.8)
New Zealand	▲ 529 (3.6)	5	10.1	542 (4.7) ▲	516 (4.2)	27 (5.4)
Scotland	▲ 528 (3.6)	5	9.8	537 (3.9) ▲	519 (4.2)	17 (4.0)
Singapore	▲ 528 (5.2)	4	10.1	540 (5.3) ▲	516 (5.7)	24 (4.1)
Russian Federation	▲ 528 (4.4)	3 or 4	10.3	534 (4.3) ▲	522 (4.8)	12 (2.3)
Hong Kong, SAR	▲ 528 (3.1)	4	10.2	538 (3.0) ▲	519 (3.5)	19 (2.9)
France	▲ 525 (2.4)	4	10.1	531 (2.7) ▲	520 (3.0)	11 (3.3)
Greece	▲ 524 (3.5)	4	9.9	535 (3.8) ▲	514 (4.0)	21 (3.9)
Slovak Republic	▲ 518 (2.8)	4	10.3	526 (3.0) ▲	510 (3.3)	16 (3.0)
Iceland	▲ 512 (1.2)	4	9.7	522 (1.9) ▲	503 (1.5)	19 (2.4)
Romania	▲ 512 (4.6)	4	11.1	519 (4.2) ▲	504 (5.7)	14 (3.8)
Israel	▲ 509 (2.8)	4	10.0	520 (3.4) ▲	498 (3.7)	22 (4.3)
Slovenia	502 (2.0)	3	9.8	512 (2.5) ▲	491 (2.4)	22 (2.8)
International Avg.	500 (0.6)	4	10.3	510 (0.7) ▲	490 (0.7)	20 (0.7)
Norway	499 (2.9)	4	10.0	510 (3.5) ▲	489 (3.4)	21 (3.9)
Cyprus	▼ 494 (3.0)	4	9.7	506 (3.3) ▲	482 (3.6)	24 (3.5)
Moldova, Rep. of	▼ 492 (4.0)	4	10.8	504 (4.7) ▲	479 (4.0)	25 (4.0)
Turkey	▼ 449 (3.5)	4	10.2	459 (4.0) ▲	440 (3.7)	19 (3.1)
Macedonia, Rep. of	▼ 442 (4.6)	4	10.7	452 (5.1) ▲	431 (4.8)	21 (3.6)
Colombia	▼ 422 (4.4)	4	10.5	428 (5.1) ▲	416 (4.7)	12 (4.3)
Argentina	▼ 420 (5.9)	4	10.2	428 (6.2) ▲	410 (6.5)	18 (4.7)
Iran, Islamic Rep. of	▼ 414 (4.2)	4	10.4	426 (5.7) ▲	399 (5.6)	27 (8.1)
Kuwait	▼ 396 (4.3)	4	9.9	422 (5.6) ▲	373 (6.3)	48 (8.4)
Morocco	▼ 350 (9.6)	4	11.2	361 (9.6) ▲	341 (10.9)	20 (6.8)
Belize	▼ 327 (4.7)	4	9.8	341 (5.3) ▲	314 (5.2)	27 (4.8)
Ontario (Canada)	▲ 548 (3.3)	4	9.9	558 (3.8) ▲	538 (3.4)	20 (2.7)
Quebec (Canada)	▲ 537 (3.0)	4	10.2	544 (3.4) ▲	530 (3.1)	14 (2.7)

SOURCE: IEA Progress in International Reading Literacy Study (PIRLS 2001)

▲ Country average significantly higher than international average

▼ Country average significantly lower than international average

▲ Significantly higher than other gender

1 National Desired Population does not cover all of International Desired Population. Because coverage falls below 65%, Canada is annotated Canada (O, Q) for the provinces of Ontario and Quebec only.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Each of these purposes for reading is usually associated with certain types of texts. For example, reading for literary experience is often accomplished through reading fiction, while reading to acquire and use information is generally associated with informative articles and instructional texts. The early reading of most young children centers on literary and narrative text types. In PIRLS 2001, the literary texts were narrative fiction in the form of short stories. In addition, many young readers also enjoy acquiring information from books and other types of reading material. This kind of reading becomes more important as students develop their literacy abilities, and is increasingly required in order to learn across the curriculum. The informational texts in PIRLS included short informational materials involving text, maps, illustrations, diagrams, and photographs organized topically or chronologically.

The results for the two purposes were similar but not identical to the results overall. In reading for literary purposes, Sweden and England had the highest average achievement, with Sweden having significantly higher mean achievement than the rest of the other participating countries and England performing significantly better than all the other countries except The Netherlands, the United States and Bulgaria. Only Sweden outperformed The Netherlands, the United States, and Bulgaria. In reading for informational purposes, Sweden, The Netherlands, and Bulgaria had the highest average achievement. Sweden had significantly higher achievement than the rest of the countries and The Netherlands and Bulgaria performed significantly better than all the other countries except Latvia and England, who were outperformed only by Sweden.

However, while the ordering is similar for the two purposes and overall achievement, there were some interesting differences between literary and informational reading in the relative performance of the PIRLS countries. Exhibit 2 displays the difference between average achievement in the literary and informational purposes for each country.[1] Interestingly, the results reveal that many countries performed relatively better or worse in one purpose compared to the other (darkened bar indicates difference is statistically significant). Differences in relative performance may be related to one or more of a number of factors, such as emphases in intended curricula or widely used textbooks, strengths or weaknesses in curriculum implementation, and the grade level at which certain reading comprehension strategies are introduced.

Countries with significantly higher relative performance in reading for literary purposes included the United States, Iceland, Norway, England, Iran, Hungary, Cyprus, Italy, Greece, New Zealand, Lithuania, Israel, and Canada (O,Q). Countries with higher relative performance in reading for informational purposes included Moldova, Hong Kong, France, Morocco, the Slovak Republic, Latvia, Kuwait, the Russian Federation, Macedonia, Slovenia, and Turkey.

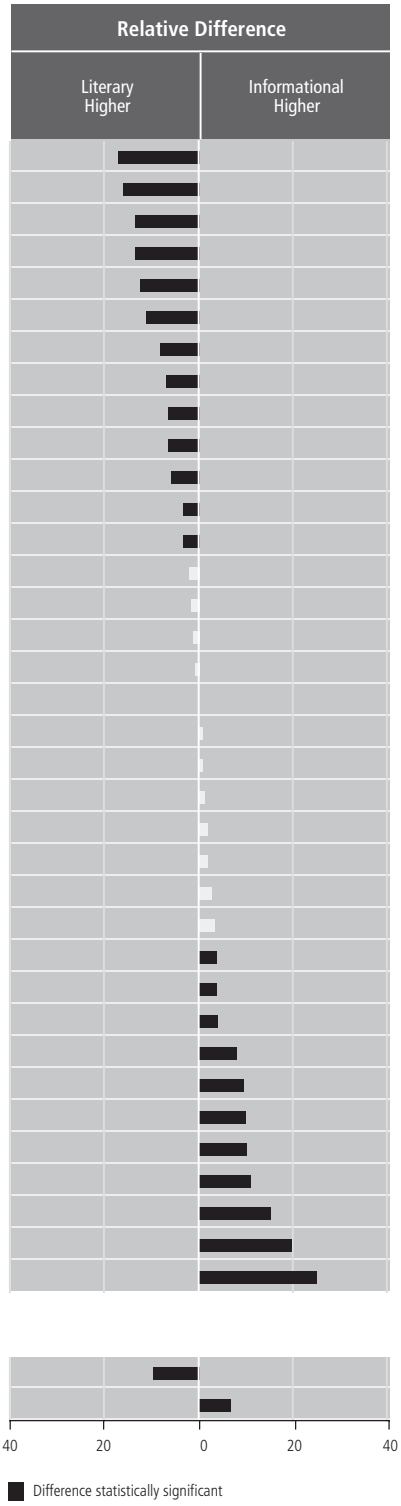
Exhibit 3 shows average achievement by gender in reading for literary and informational purposes (listed alphabetically by country). Mirroring the overall results, girls had significantly higher achievement than boys for both major reading purposes in each country. In some countries, however, the gender differences appeared to be somewhat more pronounced for the literary than the informational purposes. This is consistent with the previous IEA reading literacy study showing that the largest differences between girls and boys typically were found in the narrative domain (Wagemaker, 1996).

1 Since the PIRLS scales were developed using Item Response Theory (IRT) technology (see *PIRLS 2001 Technical Report*) like all such scales the Literary and Informational scales cannot be described in absolute terms. While the scales are expressed in the same numerical units, they are not directly comparable in terms of being able to say how much achievement or learning in one equals how much achievement or learning in the other.

Exhibit 2: Relative Difference in Performance Between Literary and Informational Purposes

PIRLS

Countries	Literary Average Scale Score	Informational Average Scale Score	Relative Difference
United States	550 (3.8)	533 (3.7)	17 (1.2)
Iceland	520 (1.3)	504 (1.5)	16 (1.3)
Norway	506 (2.7)	492 (2.8)	14 (1.3)
England	559 (3.9)	546 (3.6)	14 (1.8)
Iran, Islamic Rep. of	421 (4.5)	408 (4.6)	12 (1.9)
Hungary	548 (2.0)	537 (2.2)	11 (1.1)
Cyprus	498 (2.5)	490 (3.0)	8 (1.2)
Italy	543 (2.7)	536 (2.4)	7 (1.2)
Greece	528 (3.3)	521 (3.7)	7 (1.7)
New Zealand	531 (3.9)	525 (3.8)	7 (2.2)
[1] Lithuania	546 (3.1)	540 (2.7)	6 (2.3)
Israel	510 (2.6)	507 (2.9)	3 (0.9)
[1] Canada (O,Q)	545 (2.6)	541 (2.4)	3 (1.6)
Scotland	529 (3.5)	527 (3.6)	2 (1.5)
Colombia	425 (4.2)	424 (4.3)	2 (1.3)
Singapore	528 (5.6)	527 (4.8)	1 (1.1)
Sweden	559 (2.4)	559 (2.2)	1 (1.1)
International Avg.	500 (0.6)	500 (0.7)	0 (0.2)
Netherlands	552 (2.5)	553 (2.6)	1 (0.9)
Romania	512 (4.7)	512 (4.6)	1 (1.5)
Czech Republic	535 (2.3)	536 (2.7)	1 (1.7)
Germany	537 (1.9)	538 (1.9)	2 (1.3)
Bulgaria	550 (3.9)	551 (3.6)	2 (1.6)
Belize	330 (4.9)	332 (4.9)	3 (2.5)
Argentina	419 (5.8)	422 (5.4)	3 (1.8)
Turkey	448 (3.4)	452 (3.8)	4 (1.4)
Slovenia	499 (1.8)	503 (1.9)	4 (1.3)
Macedonia, Rep. of	441 (4.5)	445 (5.2)	4 (1.5)
Russian Federation	523 (3.9)	531 (4.3)	8 (1.7)
Kuwait	394 (3.8)	403 (4.5)	9 (1.4)
Latvia	537 (2.2)	547 (2.3)	10 (1.9)
Slovak Republic	512 (2.6)	522 (2.7)	10 (1.3)
Morocco	347 (8.4)	358 (10.9)	11 (3.7)
France	518 (2.6)	533 (2.5)	15 (1.2)
Hong Kong, SAR	518 (3.1)	537 (2.9)	20 (0.9)
Moldova, Rep. of	480 (3.7)	505 (4.7)	25 (1.9)
Ontario (Canada)	551 (3.3)	542 (3.2)	10 (1.3)
Quebec (Canada)	534 (3.0)	541 (2.9)	7 (1.8)



SOURCE: IEA Progress in International Reading Literacy Study (PIRLS 2001)

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( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Exhibit 3: Reading for Literary and Informational Purposes by Gender

PIRLS

Countries	Literary			Informational		
	Girls Average Scale Score	Boys Average Scale Score	Difference	Girls Average Scale Score	Boys Average Scale Score	Difference
Argentina	429 (6.2) ▲	408 (6.2)	21 (4.6)	429 (6.0) ▲	415 (5.9)	15 (4.9)
Belize	340 (5.3) ▲	320 (5.6)	20 (5.1)	349 (5.1) ▲	316 (5.9)	32 (5.0)
Bulgaria	563 (4.2) ▲	535 (5.1)	28 (5.4)	561 (3.4) ▲	541 (4.2)	20 (3.1)
[1] Canada (O,Q)	554 (3.0) ▲	535 (2.7)	19 (2.2)	549 (3.0) ▲	534 (2.6)	16 (2.7)
Colombia	431 (4.9) ▲	419 (4.8)	12 (4.6)	430 (5.2) ▲	417 (4.9)	12 (5.4)
Cyprus	512 (2.9) ▲	485 (3.3)	26 (3.7)	500 (3.1) ▲	480 (3.5)	20 (2.8)
Czech Republic	543 (2.7) ▲	528 (2.7)	14 (2.8)	541 (3.3) ▲	532 (3.1)	9 (3.5)
England	574 (4.9) ▲	544 (4.0)	30 (4.3)	554 (4.0) ▲	537 (4.0)	17 (3.5)
France	524 (2.9) ▲	513 (3.2)	11 (3.2)	540 (2.9) ▲	527 (3.1)	12 (3.3)
Germany	544 (2.1) ▲	529 (2.4)	14 (2.5)	543 (2.5) ▲	533 (2.1)	10 (2.6)
Greece	539 (3.8) ▲	516 (3.7)	23 (3.5)	529 (3.9) ▲	513 (4.4)	15 (3.8)
Hong Kong, SAR	528 (3.4) ▲	507 (3.4)	21 (3.4)	546 (2.8) ▲	529 (3.6)	17 (3.1)
Hungary	558 (2.1) ▲	538 (2.6)	20 (2.5)	542 (2.5) ▲	532 (2.8)	10 (3.0)
Iceland	531 (1.9) ▲	509 (1.7)	21 (2.4)	512 (1.9) ▲	496 (2.0)	16 (2.6)
Iran, Islamic Rep. of	433 (5.7) ▲	406 (6.4)	28 (8.7)	419 (6.4) ▲	395 (6.1)	24 (8.8)
Israel	521 (3.3) ▲	498 (3.2)	23 (3.9)	518 (3.5) ▲	495 (3.6)	23 (4.2)
Italy	549 (2.7) ▲	538 (3.3)	11 (2.8)	539 (2.7) ▲	533 (2.6)	6 (2.6)
Kuwait	416 (5.2) ▲	373 (5.4)	43 (7.4)	430 (6.1) ▲	378 (6.7)	52 (9.1)
Latvia	548 (2.8) ▲	527 (2.2)	21 (2.4)	558 (2.8) ▲	537 (2.6)	22 (2.8)
[1] Lithuania	554 (3.4) ▲	536 (3.7)	18 (3.8)	548 (2.9) ▲	532 (2.9)	16 (2.8)
Macedonia, Rep. of	453 (4.6) ▲	430 (4.9)	22 (3.3)	454 (5.6) ▲	437 (5.8)	17 (4.8)
Moldova, Rep. of	492 (4.3) ▲	468 (3.6)	23 (3.4)	516 (5.5) ▲	494 (4.7)	23 (4.5)
Morocco	358 (8.5) ▲	340 (9.1)	19 (5.1)	370 (10.8) ▲	349 (11.9)	20 (6.3)
Netherlands	561 (2.8) ▲	544 (3.2)	17 (3.3)	559 (2.9) ▲	547 (2.9)	11 (2.4)
New Zealand	546 (4.7) ▲	517 (4.6)	30 (5.1)	536 (4.5) ▲	514 (4.4)	21 (4.6)
Norway	519 (3.4) ▲	494 (3.1)	24 (3.6)	499 (3.7) ▲	486 (3.1)	14 (3.9)
Romania	518 (4.2) ▲	505 (6.1)	13 (4.4)	519 (4.6) ▲	506 (5.6)	13 (4.3)
Russian Federation	531 (3.9) ▲	517 (4.3)	14 (2.9)	536 (4.5) ▲	527 (4.6)	9 (2.8)
Scotland	538 (4.0) ▲	519 (4.1)	19 (3.9)	534 (4.3) ▲	520 (4.1)	14 (4.4)
Singapore	541 (5.7) ▲	516 (6.0)	25 (4.2)	538 (4.9) ▲	517 (5.3)	21 (3.8)
Slovak Republic	519 (2.9) ▲	505 (2.9)	14 (2.8)	530 (2.8) ▲	514 (3.4)	16 (3.3)
Slovenia	509 (2.4) ▲	490 (2.4)	19 (3.1)	514 (2.6) ▲	492 (2.5)	21 (3.4)
Sweden	572 (2.9) ▲	547 (2.6)	25 (2.8)	568 (2.8) ▲	550 (2.6)	18 (3.2)
Turkey	460 (3.8) ▲	437 (3.6)	22 (2.9)	460 (4.6) ▲	444 (4.2)	16 (4.5)
United States	558 (4.2) ▲	542 (4.6)	16 (4.3)	541 (4.1) ▲	525 (4.3)	16 (4.0)
International Avg.	511 (0.7) ▲	490 (0.7)	21 (0.7)	509 (0.7) ▲	491 (0.8)	18 (0.8)
Ontario (Canada)	563 (4.0) ▲	540 (3.3)	24 (3.2)	550 (3.9) ▲	533 (3.4)	17 (3.5)
Quebec (Canada)	541 (3.5) ▲	526 (3.4)	15 (3.5)	546 (3.3) ▲	535 (3.1)	10 (2.9)

▲ Significantly higher than other gender

SOURCE: IEA Progress in International Reading Literacy Study (PIRLS 2001)

1 National Desired Population does not cover all of International Desired Population. Because coverage falls below 65%, Canada is annotated Canada (O, Q) for the provinces of Ontario and Quebec only.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Description of the PIRLS Reading Processes

Within reading for literary and informational purposes, the test questions or items were designed to measure four major processes of reading comprehension described in the framework. Since the *PIRLS 2001 International Report* did not contain achievement results for these reading processes, the primary purpose of this paper is to present the newly analyzed PIRLS 2001 results for these reading purposes. Briefly, the PIRLS 2001 reading comprehension processes are:

- **Focus on and Retrieve Explicitly Stated Information**: These types of questions required students to recognize information or ideas presented in the text in relation to answers sought. The specific information to be retrieved typically was located in a single sentence or phrase (approximately 20% of the assessment).
- **Make Straightforward Inferences**: Based mostly on information contained in the texts, usually these types of questions required students to connect two ideas presented in adjacent sentences and fill in a "gap" in meaning. Skilled readers often make these kinds of inferences automatically, recognizing the relationship even though it is not stated in the text (approximately 40% of the assessment).
- **Interpret and Integrate Ideas and Information**: For these questions, students needed to process the text beyond the phrase or sentence level. Sometimes they were asked to make connections that were not only implicit, but needed to draw on their own knowledge and experiences (approximately 25% of the assessment).
- **Examine and Evaluate Content, Language, and Textual Elements**: These questions required students to draw on their knowledge of text genre and structure, as well as their understanding of language conventions and devices (approximately 15% of the assessment).

Considerations in Producing the PIRLS Reading Process Scales

In approaching the scaling task, several issues were considered. First, of course, was the *PIRLS 2001 Framework* specifying four major reading processes considered necessary for fourth-grade students to be successful readers. An initial aim of the scaling was to provide results for all four processes. However, as noted above, the assessment did not contain an equal number of items in each process category. The number of items (score points) [2] available for scaling each process is noted below:

25	Focus on and Retrieve Explicitly Stated Information
27	Make Straightforward Inferences
31	Interpret and Integrate Ideas and Information
15	Examine and Evaluate Content, Language, and Textual Elements

Given the number of items available for analysis, it was anticipated that it would not be possible to create all four scales. Indeed the attempt to create four separate scales did not succeed because, in a number of countries, the scaling software was unable to determine a solution. The next step, then, was to consider combining some of the process categories.

In planning PIRLS 2006, National Research Coordinators (NRCs) were very much in favor creating process scales, which they felt would be an important addition to the assessment, although not one to be taken lightly since scaling by all four process areas would likely necessitate increasing the number of items in the assessment. With a view to conducting research on the PIRLS 2001 data and the possible need to combine process areas to create such scales, the NRCs made two different suggestions for reducing from four to three scales:

- Combine the retrieving and straightforward inferencing scales, since they are both essentially text based and can be considered similar. Leave the other two scales separate, because even though they require more reasoning skills they seem different.

2 The constructed-response items took three different forms: responses to one-point items were scored acceptable if they contained the necessary information, responses to two-point items were given full credit (2 points) and partial credit (1 point), and three-point items were given full credit (3 points) and two different levels of partial credit – satisfactory (2 points) and minimal (1 point).

- Leave the retrieving and straightforward inferencing scales separate, because they may have enough items to support scaling and are important areas at the fourth grade. Combine the other two since they both require reasoning and the evaluate scale has very few items.

In addition to providing an additional perspective on the PIRLS results, another motivation for scaling the PIRLS 2001 comprehension processes was to facilitate comparisons between PIRLS and the OECD's PISA 2000 for countries that participated in the two studies. PISA results are reported on a dimension similar to the PIRLS processes. The concept of reading literacy in PISA had three dimensions: the type of reading task, the form and structure of the reading materials, and the use for which the text was constructed (OECD, 2002). According to PISA, competence is best understood in terms of the first of these – type of reading task. The other two dimensions are considered properties of the reading task materials that were helpful in ensuring that a range of tasks was included in the tests.

A major difficulty in producing comparable information between PIRLS and PISA, however, is that since PIRLS is for fourth-grade students (typically 10 years old) and PISA is for 15-year-olds – the two studies emphasize different processes. Appropriately in view of the stage in schooling assessed (fourth grade), PIRLS devotes considerable effort to measuring students' ability to locate and retrieve straightforward information. In PISA students are not assessed on the most basic reading skills, since it is assumed the most 15-year-olds have already acquired these skills.

Within the "type of reading task" dimension, the PISA 2000 assessment of reading literacy at age 15 included five different categories of questions. Students were expected to demonstrate their proficiency in *retrieving* information, *understanding* texts at a general level, *interpreting* them, *reflecting* on the content and form of texts in relation to their own knowledge of world, and *evaluating* and arguing their own point of view. However, given the high correlations between the five categories, a more parsimonious model consisting of just three scales was adopted for reporting purposes (Turner, 2002). A "retrieving information" scale, which combines retrieving and understanding, reports on students' ability to locate information in a text. An "interpreting

texts'' scale reports on the ability to construct meaning and draw inferences from written information. A ''reflection and evaluation'' scale reports on students' ability to relate text to their knowledge, ideas, and experiences.

As it turned out, the number of data points available in PIRLS 2001 enabled combining the process categories into two scales. One scale combines retrieval and straightforward inferencing processes (as per one NRC suggestion) and would be in some sense similar to the PISA ''retrieving information'' scale. The second PIRLS scale combines the interpreting and integrating processes with the examining and evaluating processes (another NRC suggestion), and is called the interpreting, integrating, and evaluating scale. This is not directly similar with PISA but was necessitated by the small number of items assessing the examining and evaluating processes, relatively advanced areas for fourth-grade students.

Achievement in PIRLS Reading Processes

Performance in retrieval and straightforward inferencing processes is presented for each of the PIRLS 2001 countries in Exhibits 4 and 5. These exhibits, respectively, present the distributions of student achievement in reading for retrieval and straightforward inferencing processes and the comparisons in mean achievement among pairs of individual countries. Exhibits 6 and 7 contain the corresponding data for student's achievement for interpreting, integrating, and evaluating processes.

In Exhibits 4 and 6 displaying the distributions in reading achievement for the two processes, respectively, countries are shown in decreasing order of average (mean) scale score, together with an indication of whether the country average is significantly higher or lower than the international average. To allow comparison of the relative performance of each country for each of the two reading process scales, the international average for each process was scaled to be 500, the same as the overall international average.

The range in performance across the participating countries was nearly identical for the retrieval and straightforward inferencing processes as compared to the interpreting, integrating, and evaluating processes. Beginning with top-

performing Sweden, it can be seen that 21 countries had average achievement for the retrieving and straightforward inferencing processes that was above the international average. Four countries had achievement about at the international average, and the remaining 10 countries had average achievement below the international average. Interestingly, a few more countries (23) performed significantly above the international average for the interpreting, integrating, and evaluating processes and somewhat fewer (8) below the international average.

Exhibits 5 and 7 compare overall mean achievement among individual countries for the two process scales, respectively. These exhibits show whether or not the differences in average achievement between pairs of countries are statistically significant. Selecting a country of interest and reading across the table, a triangle pointing up indicates significantly higher performance than the comparison country listed across the top; absence of symbol indicates no significant difference in performance; and a triangle pointing down indicates significantly lower performance.

Sweden had the highest average achievement for the retrieval and straightforward inferencing processes. The Netherlands and Bulgaria outperformed all the rest of the participating countries except Sweden. England, Germany, Latvia, and Lithuania also performed very well. For the interpreting, integrating, and evaluating processes, Sweden, England, The Netherlands, and Bulgaria all performed similarly. Also, Canada (O,Q) and the United States were outperformed only by Sweden.

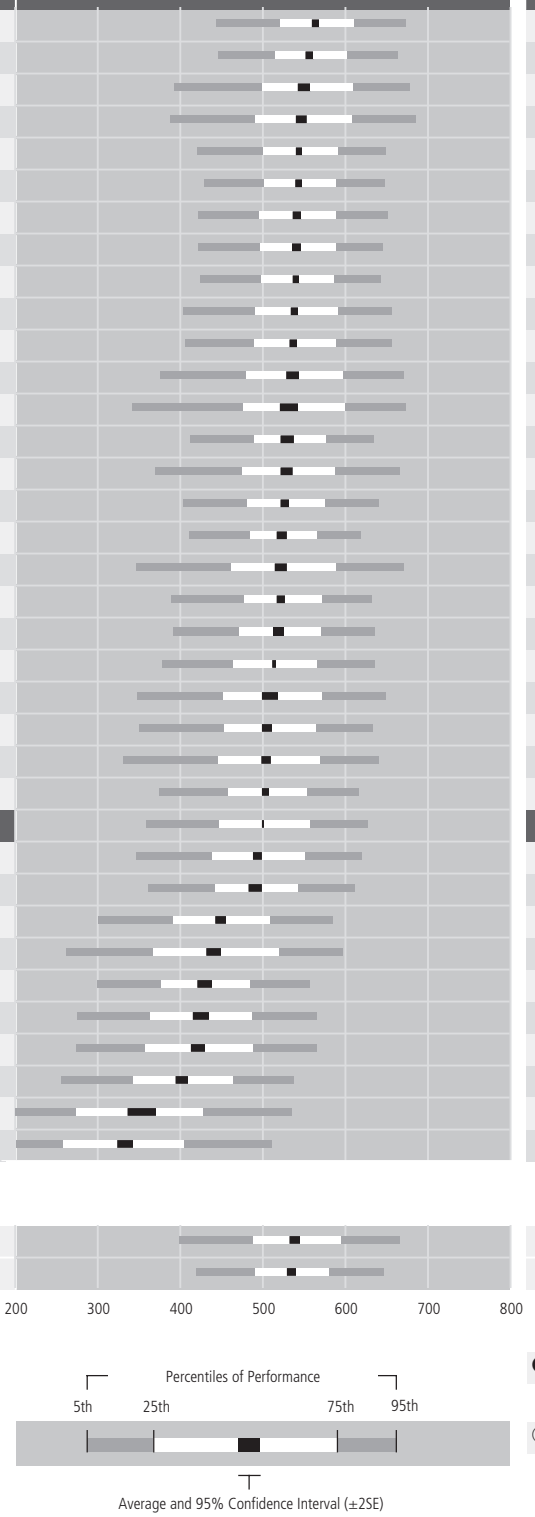
Relative Strengths and Weaknesses in Reading Processes

Exhibit 8 displays the difference for each country between average achievement in the retrieval and straightforward inferencing processes as compared to that for the interpreting, integrating, and evaluating processes. It is not appropriate to compare numerical scale scores directly between the two process scales, but it is possible to determine relative strengths of countries in the two different processes, on the basis of their relative rank-order positions on the respective scales. The results reveal that many countries performed relatively better or worse in one process compared to the other (darkened bar indicates difference is statistically significant).

Exhibit 4: Distribution of Reading Achievement for Retrieval and Straightforward Inferencing Processes

PIRLS

Countries	Average Scale Score	Years of Formal Schooling	Average Age
Sweden	563 (2.3)	4	10.8
Netherlands	556 (2.5)	4	10.3
Bulgaria	550 (4.0)	4	10.9
England	546 (3.3)	5	10.2
Germany	543 (1.9)	4	10.5
Latvia	543 (2.2)	4	11.0
[1] Lithuania	541 (2.9)	4	10.9
Czech Republic	540 (2.6)	4	10.5
Hungary	540 (2.1)	4	10.7
Italy	538 (2.4)	4	9.8
[1] Canada (O,Q)	536 (2.4)	4	10.0
United States	535 (3.9)	4	10.2
Singapore	531 (5.6)	4	10.1
Russian Federation	529 (4.0)	3 or 4	10.3
Scotland	529 (3.7)	5	9.8
France	526 (2.7)	4	10.1
Hong Kong, SAR	522 (3.2)	4	10.2
New Zealand	522 (3.7)	5	10.1
Slovak Republic	521 (2.7)	4	10.3
Greece	519 (3.3)	4	9.9
Iceland	513 (1.3)	4	9.7
Romania	509 (5.2)	4	11.1
Norway	505 (2.9)	4	10.0
Israel	503 (2.9)	4	10.0
Slovenia	503 (2.3)	3	9.8
International Avg.	500 (0.6)	4	10.3
Cyprus	493 (2.8)	4	9.7
Moldova, Rep. of	491 (4.1)	4	10.8
Turkey	448 (3.3)	4	10.2
Macedonia, Rep. of	441 (4.6)	4	10.7
Colombia	429 (4.4)	4	10.5
Argentina	424 (5.0)	4	10.2
Iran, Islamic Rep. of	422 (4.4)	4	10.4
Kuwait	401 (4.0)	4	9.9
Morocco	353 (8.9)	4	11.2
Belize	333 (5.0)	4	9.8
Ontario (Canada)	538 (3.3)	4	9.9
Quebec (Canada)	534 (3.0)	4	10.2



SOURCE: IEA Progress in International Reading Literacy Study (PIRLS 2001)

1 National Desired Population does not cover all of International Desired Population. Because coverage falls below 65%, Canada is annotated Canada (O, Q) for the provinces of Ontario and Quebec only.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Exhibit 5: Multiple Comparisons of Average Reading Achievement for Retrieval and Straightforward Inferencing Processes

PIRLS

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

	Sweden	Netherlands	Bulgaria	England	Germany	Latvia	Lithuania	Czech Republic	Hungary	Italy	Canada (O,Q)	United States	Singapore	Russian Federation	Scotland	France	Hong Kong, SAR	New Zealand	Slovak Republic	Greece	Iceland	Romania	Norway	Israel	Slovenia	Cyprus	Moldova, Rep. of	Turkey	Macedonia, Rep. of	Colombia	Argentina	Iran, Islamic Rep. of	Kuwait	Morocco	Belize
Sweden		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Netherlands	▼			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Bulgaria	▼							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
England	▼	▼									▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Germany	▼	▼									▲		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Latvia	▼	▼									▲		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Lithuania	▼	▼												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Czech Republic	▼	▼	▼											▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hungary	▼	▼	▼											▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Italy	▼	▼	▼												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
* Canada (O,Q)	▼	▼	▼	▼	▼	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
United States	▼	▼	▼	▼													▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Singapore	▼	▼	▼	▼	▼	▼															▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Russian Federation	▼	▼	▼	▼	▼	▼	▼	▼	▼											▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Scotland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
France	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hong Kong, SAR	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
New Zealand	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovak Republic	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Greece	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Iceland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Romania	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Norway	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Israel	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovenia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Cyprus	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	▲	▲	▲	▲	▲	▲
Moldova, Rep. of	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	▲	▲	▲	▲	▲	▲
Turkey	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	▲	▲	▲	▲
Macedonia, Rep. of	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲
Colombia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲
Argentina	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲
Iran, Islamic Rep. of	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲
Kuwait	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Morocco	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲
Belize	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
* Ontario (Canada)	▼	▼	▼												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
* Quebec (Canada)	▼	▼	▼	▼	▼	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲

▲ Average achievement significantly higher than comparison country

▼ Average achievement significantly lower than comparison country

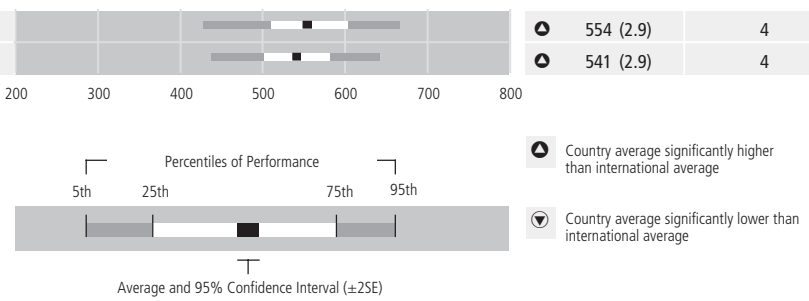
SOURCE: IEA Progress in International Reading Literacy Study (PIRLS 2001)

* Canada is represented by the provinces of Ontario and Quebec only. The international average does not include the results from these provinces separately.

Exhibit 6: Distribution of Reading Achievement for Interpreting, Integrating, and Evaluating Processes

PIRLS

Countries	Reading Achievement Scale Score	Average Scale Score	Years of Formal Schooling	Average Age
Sweden		▲ 558 (2.2)	4	10.8
England		▲ 556 (3.2)	5	10.2
Netherlands		▲ 552 (2.4)	4	10.3
Bulgaria		▲ 550 (3.6)	4	10.9
[1] Canada (O,Q)		▲ 549 (2.2)	4	10.0
United States		▲ 548 (3.2)	4	10.2
Latvia		▲ 545 (2.1)	4	11.0
[1] Lithuania		▲ 545 (2.6)	4	10.9
Hungary		▲ 545 (1.9)	4	10.7
Italy		▲ 541 (2.5)	4	9.8
New Zealand		▲ 535 (3.8)	5	10.1
Germany		▲ 535 (1.9)	4	10.5
Czech Republic		▲ 533 (2.4)	4	10.5
Hong Kong, SAR		▲ 533 (3.2)	4	10.2
Greece		▲ 529 (3.6)	4	9.9
Scotland		▲ 528 (3.7)	5	9.8
Singapore		▲ 527 (4.9)	4	10.1
Russian Federation		▲ 525 (4.5)	3 or 4	10.3
France		▲ 524 (2.4)	4	10.1
Romania		▲ 515 (4.5)	4	11.1
Israel		▲ 513 (2.9)	4	10.0
Slovak Republic		▲ 513 (3.0)	4	10.3
Iceland		▲ 512 (1.3)	4	9.7
Slovenia		501 (2.2)	3	9.8
International Avg.		500 (0.6)	4	10.3
Cyprus		495 (2.8)	4	9.7
Norway		495 (2.8)	4	10.0
Moldova, Rep. of		494 (4.0)	4	10.8
Turkey		▼ 451 (3.6)	4	10.2
Macedonia, Rep. of		▼ 446 (4.8)	4	10.7
Colombia		▼ 417 (4.7)	4	10.5
Argentina		▼ 413 (6.3)	4	10.2
Iran, Islamic Rep. of		▼ 405 (5.0)	4	10.4
Kuwait		▼ 392 (4.7)	4	9.9
Morocco		▼ 351 (10.0)	4	11.2
Belize		▼ 329 (4.7)	4	9.8
Ontario (Canada)		▲ 554 (2.9)	4	9.9
Quebec (Canada)		▲ 541 (2.9)	4	10.2



SOURCE: IEA Progress in International Reading Literacy Study (PIRLS 2001)

1 National Desired Population does not cover all of International Desired Population. Because coverage falls below 65%, Canada is annotated Canada (O, Q) for the provinces of Ontario and Quebec only.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Exhibit 7: Multiple Comparisons of Average Reading Achievement for Interpreting, Integrating, and Evaluating Processes

PIRLS

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

	Sweden	England	Netherlands	Bulgaria	Canada (O,Q)	United States	Latvia	Lithuania	Hungary	Italy	New Zealand	Germany	Czech Republic	Hong Kong, SAR	Greece	Scotland	Singapore	Russian Federation	France	Romania	Israel	Slovak Republic	Iceland	Slovenia	Cyprus	Norway	Moldova, Rep. of	Turkey	Macedonia, Rep. of	Colombia	Argentina	Iran, Islamic Rep. of	Kuwait	Morocco	Belize
Sweden					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
England							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Netherlands							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Bulgaria										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
* Canada (O,Q)	▼									▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
United States	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Latvia	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Lithuania	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hungary	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Italy	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
New Zealand	▼	▼	▼	▼	▼	▼	▼	▼	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Germany	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Czech Republic	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hong Kong, SAR	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Greece	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Scotland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Singapore	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼											▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Russian Federation	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼											▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
France	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Romania	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Israel	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovak Republic	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Iceland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovenia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲
Cyprus	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲
Norway	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲
Moldova, Rep. of	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲
Turkey	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲
Macedonia, Rep. of	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲
Colombia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲
Argentina	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲
Iran, Islamic Rep. of	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲
Kuwait	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲
Morocco	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲
Belize	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
* Ontario (Canada)							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
* Quebec (Canada)	▼	▼	▼	▼	▼								▲		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲

▲ Average achievement significantly higher than comparison country

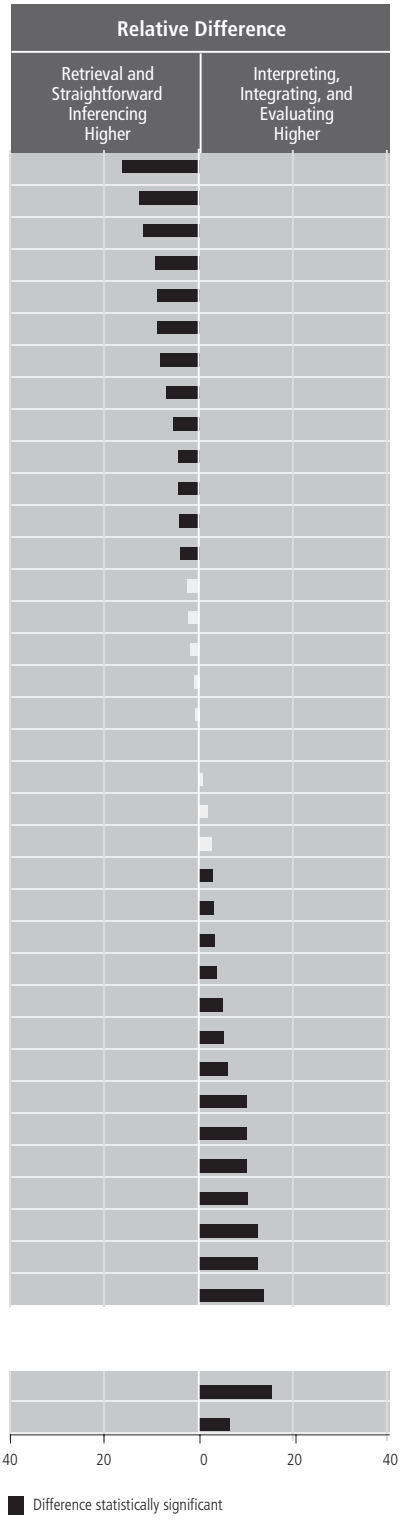
▼ Average achievement significantly lower than comparison country

SOURCE: IEA Progress in International Reading Literacy Study (PIRLS 2001)

* Canada is represented by the provinces of Ontario and Quebec only. The international average does not include the results from these provinces separately.

Exhibit 8: Relative Difference in Performance Between Reading Processes

Countries	Retrieval and Straightforward Inferencing Average Scale Score	Interpreting, Integrating, and Evaluating Average Scale Score	Relative Difference
Iran, Islamic Rep. of	422 (4.4)	405 (5.0)	16 (1.3)
Colombia	429 (4.4)	417 (4.7)	13 (1.5)
Argentina	424 (5.0)	413 (6.3)	12 (2.2)
Norway	505 (2.9)	495 (2.8)	9 (1.6)
Kuwait	401 (4.0)	392 (4.7)	9 (1.4)
Germany	543 (1.9)	535 (1.9)	9 (0.5)
Slovak Republic	521 (2.7)	513 (3.0)	8 (1.4)
Czech Republic	540 (2.6)	533 (2.4)	7 (1.8)
Sweden	563 (2.3)	558 (2.2)	5 (1.4)
Belize	333 (5.0)	329 (4.7)	4 (1.7)
Netherlands	556 (2.5)	552 (2.4)	4 (0.7)
Singapore	531 (5.6)	527 (4.9)	4 (0.9)
Russian Federation	529 (4.0)	525 (4.5)	4 (1.4)
Morocco	353 (8.9)	351 (10.0)	2 (2.1)
France	526 (2.7)	524 (2.4)	2 (1.3)
Slovenia	503 (2.3)	501 (2.2)	2 (1.4)
Scotland	529 (3.7)	528 (3.7)	1 (1.1)
Iceland	513 (1.3)	512 (1.3)	1 (1.1)
International Avg.	500 (0.6)	500 (0.6)	0 (0.1)
Bulgaria	550 (4.0)	550 (3.6)	1 (1.1)
Latvia	543 (2.2)	545 (2.1)	2 (1.5)
Cyprus	493 (2.8)	495 (2.8)	3 (1.5)
Turkey	448 (3.3)	451 (3.6)	3 (1.1)
Italy	538 (2.4)	541 (2.5)	3 (1.2)
Moldova, Rep. of	491 (4.1)	494 (4.0)	3 (1.6)
[1] Lithuania	541 (2.9)	545 (2.6)	4 (1.7)
Hungary	540 (2.1)	545 (1.9)	5 (0.8)
Macedonia, Rep. of	441 (4.6)	446 (4.8)	5 (1.6)
Romania	509 (5.2)	515 (4.5)	6 (2.1)
Greece	519 (3.3)	529 (3.6)	10 (1.8)
Hong Kong, SAR	522 (3.2)	533 (3.2)	10 (1.0)
Israel	503 (2.9)	513 (2.9)	10 (1.6)
England	546 (3.3)	556 (3.2)	10 (1.0)
United States	535 (3.9)	548 (3.2)	12 (1.0)
[1] Canada (O,Q)	536 (2.4)	549 (2.2)	12 (0.6)
New Zealand	522 (3.7)	535 (3.8)	14 (1.1)
Ontario (Canada)	538 (3.3)	554 (2.9)	15 (1.6)
Quebec (Canada)	534 (3.0)	541 (2.9)	6 (1.2)



SOURCE: IEA Progress in International Reading Literacy Study (PIRLS 2001)

1 National Desired Population does not cover all of International Desired Population. Because coverage falls below 65%, Canada is annotated Canada (O, Q) for the provinces of Ontario and Quebec only.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Countries with significantly higher relative performance in the retrieval and straightforward inferencing processes included Iran, Colombia, Argentina, Norway, Kuwait, Germany, Slovak Republic, Czech Republic, Sweden, Belize, The Netherlands, Singapore, and the Russian Federation. Countries with significantly higher relative performance in the interpreting, integrating, and evaluating processes included New Zealand, Canada (O,Q), United States, England, Israel, Hong Kong, Greece, Romania, Macedonia, Hungary, Lithuania, Moldova, Italy, and Turkey.

In developing descriptions of performance at the international benchmarks along the PIRLS achievement scale (lower quarter, median, upper quarter, and top 10%) for the *PIRLS 2001 International Report*, it was discovered that, for the passages in the assessment, students at the lower quarter benchmark demonstrated the most success on items requiring retrieval of explicitly stated details from the various literary and informational texts. However, students also had some success with some items requiring straightforward inferences. In other words, lower performing students did better on the text based items. Yet, it is interesting to note that countries with relatively better performance in retrieval and straightforward inferencing processes included both higher and lower achieving countries. Five of the 10 countries performing below the international average, including Iran, Colombia, Argentina, Kuwait, and Belize, were relatively stronger in the text based comprehension processes, but so were top-performing Sweden and The Netherlands.

Interestingly, the countries with relatively higher performance in the interpreting, integrating, and evaluating processes included two groups of rather similar countries. One group includes most of the English-speaking countries – New Zealand, Canada, United States, and England. The other group includes a number of the Eastern European countries – Romania, Macedonia, Hungary, and Moldova. This result suggests that curriculum or instructional approaches may also influence students' relative achievement in these processes.

Gender Differences in Achievement for the Process Areas

Listed alphabetically by country, Exhibit 9 shows average achievement by gender in reading for the retrieval and straightforward inferencing processes and for the interpreting, integrating, and evaluating processes. Completely consistent with the overall reading results and those for the literary and informational reading purposes, girls had significantly higher achievement than boys in every country for both types of processes. On average, the female advantage was similar for the two types of processes. However, the difference was somewhat more pronounced (at least 5 points larger) for the interpreting, integrating, and evaluating processes in more than half a dozen countries, including Argentina, Iran, Israel, Kuwait, Lithuania, Scotland, and the Slovak Republic.

Scaling Methodology

The PIRLS International Study Center used essentially the same procedures to develop scales for the PIRLS reading comprehension processes as were used to develop the scales for reading overall and for the literary and informational purposes. These procedures are documented in Chapter 11 of the *PIRLS Technical Report* (Gonzalez, 2003). This scaling approach was developed originally by Educational Testing Service for use in the U.S. National Assessment of Educational Progress and also is used for TIMSS.

In brief, the procedure used Item Response Theory (IRT) scaling with multiple imputation or "plausible valuable" methodology. For the two types of reading processes, student's achievement was summarized using a family of 2- and 3-parameter IRT scaling models. For dichotomously scored items (correct or incorrect), a 3-parameter model was used with multiple-choice items and a 2-parameter model with constructed-response items (since the guessing parameter is not necessary). Generalized partial-credit models were used with polytomous constructed-response items having two or three score points.

The IRT scaling method produces a score by averaging the responses of each student to the items that he or she took which takes into account the difficulty and discriminating power of each item. Such a method was necessary because PIRLS has a matrix-sampling design, whereby students responded

to different passages and items depending on which of 9 test booklets they received. The IRT analysis provides a common scale on which performance can be compared across countries. For this analysis, achievement scales were produced for each of the two types of reading processes (retrieval and straightforward inferencing processes and interpreting, integrating, and evaluating processes). Exhibit 10 presents the Pearson correlation coefficient indicating the linear relationship between the two types of reading processes in each of the PIRLS countries. The jackknife repeated replication (JRR) technique was used to provide estimates of the sampling errors of the scale means and percentages for the two types of reading processes.

Exhibit 9: Reading for Processes by Gender

PIRLS

Countries	Retrieval and Straightforward Inferencing			Interpeting, Integrating, and Evaluating		
	Girls Average Scale Score	Boys Average Scale Score	Difference	Girls Average Scale Score	Boys Average Scale Score	Difference
Argentina	431 (5.7) ▲	418 (5.3)	13 (4.5)	422 (6.9) ▲	402 (6.9)	20 (5.7)
Belize	347 (5.0) ▲	320 (5.7)	26 (4.3)	341 (5.2) ▲	317 (5.4)	25 (4.9)
Bulgaria	561 (4.1) ▲	538 (4.9)	23 (4.1)	562 (3.4) ▲	539 (4.3)	23 (3.3)
[1] Canada (O,Q)	544 (2.7) ▲	529 (2.9)	16 (2.7)	558 (2.6) ▲	540 (2.4)	18 (2.2)
Colombia	434 (5.0) ▲	424 (4.7)	10 (4.3)	423 (5.3) ▲	410 (5.4)	13 (5.2)
Cyprus	505 (2.9) ▲	482 (4.0)	23 (4.2)	507 (3.0) ▲	484 (3.6)	23 (3.4)
Czech Republic	548 (3.4) ▲	533 (3.2)	15 (4.1)	539 (3.0) ▲	528 (3.0)	11 (3.4)
England	556 (3.9) ▲	535 (4.1)	21 (4.4)	568 (4.1) ▲	544 (3.4)	23 (3.7)
France	533 (3.0) ▲	520 (3.4)	13 (3.7)	530 (2.8) ▲	519 (3.0)	11 (3.3)
Germany	549 (2.1) ▲	538 (2.4)	11 (2.5)	541 (2.1) ▲	528 (2.2)	13 (2.3)
Greece	529 (3.6) ▲	509 (3.7)	21 (3.4)	540 (3.5) ▲	518 (4.2)	21 (3.3)
Hong Kong, SAR	531 (3.2) ▲	514 (3.6)	17 (3.0)	543 (3.2) ▲	523 (3.8)	20 (3.4)
Hungary	546 (2.4) ▲	533 (2.5)	13 (2.5)	552 (2.1) ▲	537 (2.4)	15 (2.4)
Iceland	522 (2.0) ▲	504 (1.7)	18 (2.8)	522 (1.7) ▲	503 (1.9)	20 (2.5)
Iran, Islamic Rep. o	432 (5.7) ▲	409 (6.0)	23 (8.0)	420 (6.3) ▲	388 (6.6)	31 (8.8)
Israel	513 (3.5) ▲	494 (3.7)	19 (4.2)	525 (3.3) ▲	502 (4.1)	24 (4.5)
Italy	542 (2.8) ▲	535 (2.8)	7 (2.8)	546 (2.9) ▲	537 (2.6)	9 (2.4)
Kuwait	424 (5.5) ▲	381 (5.6)	43 (7.8)	420 (5.9) ▲	367 (7.0)	53 (9.0)
Latvia	554 (3.1) ▲	533 (2.5)	21 (3.5)	556 (2.9) ▲	535 (2.0)	21 (2.5)
[1] Lithuania	547 (3.3) ▲	535 (3.3)	12 (3.5)	554 (3.4) ▲	535 (3.0)	18 (3.9)
Macedonia, Rep. of	451 (5.2) ▲	430 (4.8)	21 (3.7)	457 (5.7) ▲	435 (4.8)	22 (4.5)
Moldova, Rep. of	503 (4.7) ▲	478 (4.2)	24 (3.8)	506 (4.8) ▲	482 (3.9)	24 (4.0)
Morocco	366 (8.7) ▲	344 (10.0)	21 (6.0)	362 (10.2) ▲	342 (11.0)	20 (7.1)
Netherlands	563 (3.0) ▲	550 (3.0)	13 (3.2)	558 (2.5) ▲	546 (2.6)	12 (1.9)
New Zealand	534 (5.0) ▲	510 (4.4)	24 (5.8)	550 (4.6) ▲	521 (4.4)	28 (4.9)
Norway	515 (3.6) ▲	496 (3.7)	19 (4.3)	507 (3.4) ▲	485 (3.3)	22 (3.6)
Romania	514 (5.3) ▲	503 (6.0)	12 (4.3)	522 (4.4) ▲	507 (5.6)	15 (4.4)
Russian Federation	535 (4.1) ▲	524 (4.3)	12 (2.7)	532 (4.7) ▲	519 (4.6)	13 (2.6)
Scotland	535 (3.8) ▲	521 (4.7)	14 (4.2)	538 (3.9) ▲	517 (4.2)	21 (3.7)
Singapore	544 (5.7) ▲	520 (6.1)	24 (4.5)	538 (5.0) ▲	516 (5.3)	22 (3.6)
Slovak Republic	529 (3.0) ▲	514 (3.5)	14 (3.9)	523 (3.1) ▲	504 (3.6)	19 (3.3)
Slovenia	514 (3.4) ▲	492 (2.3)	22 (3.5)	512 (2.8) ▲	490 (2.6)	21 (3.0)
Sweden	574 (2.8) ▲	553 (2.7)	21 (3.1)	569 (2.6) ▲	547 (2.5)	22 (2.7)
Turkey	458 (3.9) ▲	440 (3.6)	18 (3.5)	461 (4.1) ▲	441 (3.8)	20 (3.4)
United States	545 (4.2) ▲	526 (4.7)	19 (4.3)	557 (3.4) ▲	539 (3.8)	18 (3.3)
International Avg.	509 (0.7) ▲	491 (0.7)	18 (0.8)	510 (0.7) ▲	490 (0.7)	20 (0.7)
Ontario (Canada)	548 (4.1) ▲	530 (3.4)	18 (3.6)	564 (3.3) ▲	544 (3.0)	21 (2.4)
Quebec (Canada)	540 (3.5) ▲	528 (3.1)	11 (3.0)	549 (3.5) ▲	533 (2.9)	16 (3.1)

▲ Significantly higher than other gender

SOURCE: IEA Progress in International Reading Literacy Study (PIRLS 2001)

1 National Desired Population does not cover all of International Desired Population. Because coverage falls below 65%, Canada is annotated Canada (O, Q) for the provinces of Ontario and Quebec only.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Exhibit 10: Correlation Between Reading for Retrieval and Straightforward Inferencing and Reading for Interpreting, Integrating and Evaluating Processes

PIRLS

Countries	Pearson Correlation Coefficient
Argentina	0.93
Belize	0.92
Bulgaria	0.93
Canada (O,Q)	0.93
Colombia	0.92
Cyprus	0.93
Czech Republic	0.88
England	0.94
France	0.92
Germany	0.94
Greece	0.88
Hong Kong, SAR	0.91
Hungary	0.92
Iceland	0.93
Iran, Islamic Rep. of	0.96
Israel	0.93
Italy	0.92
Kuwait	0.92
Latvia	0.91
Lithuania	0.88
Macedonia, Rep. of	0.95
Moldova, Rep. of	0.92
Morocco	0.90
Netherlands	0.90
New Zealand	0.92
Norway	0.92
Romania	0.93
Russian Federation	0.88
Scotland	0.91
Singapore	0.97
Slovak Republic	0.91
Slovenia	0.92
Sweden	0.92
Turkey	0.94
United States	0.96
International Median	0.92

SOURCE: IEA Progress in International Reading Literacy Study (PIRLS 2001)

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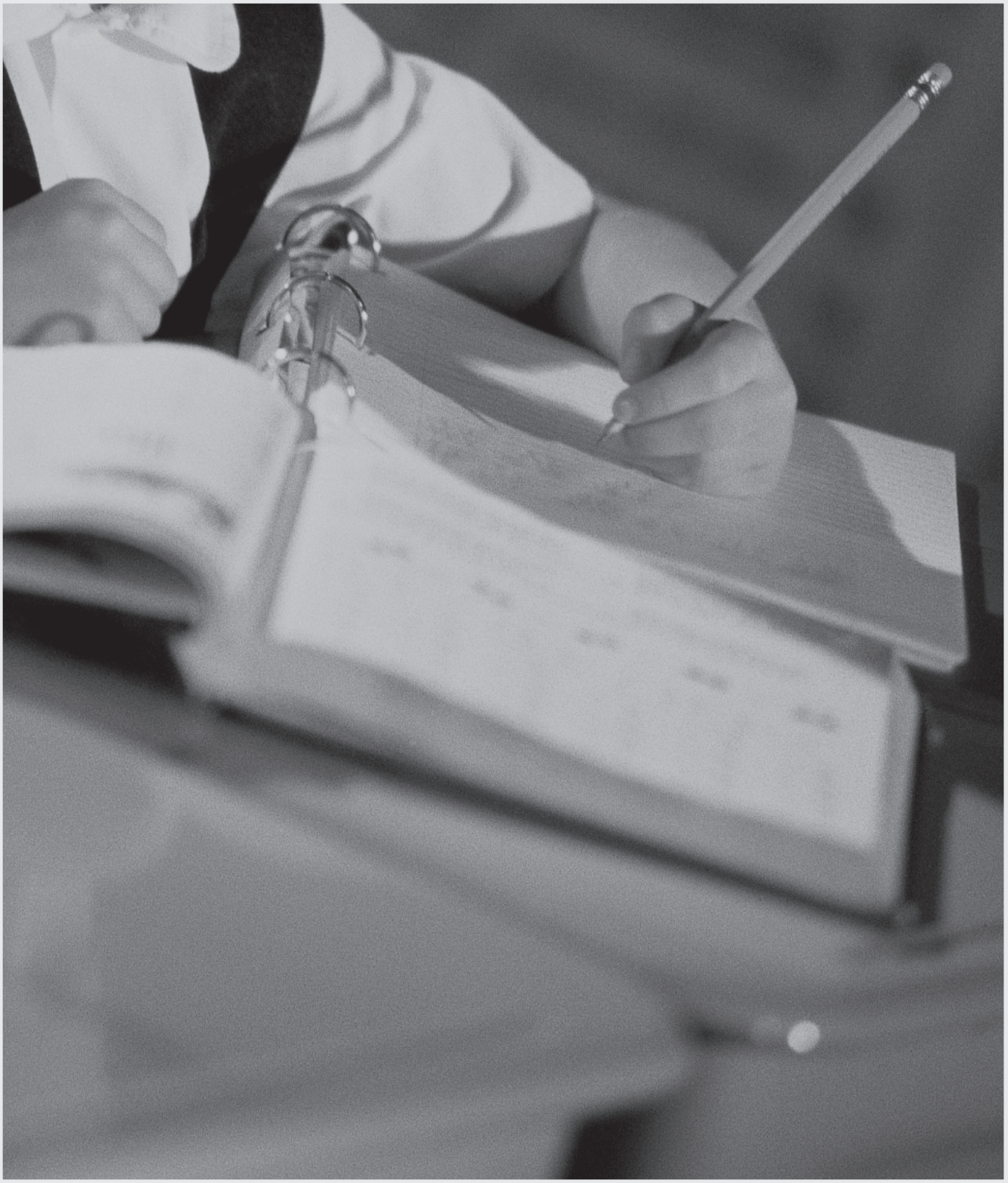

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Management and Operations

PIRLS 2001 was conducted under the auspices of the IEA. The study is directed by Ina V.S. Mullis and Michael O. Martin, and managed centrally by the staff of the International Study Center at Boston College, Lynch School of Education. The PIRLS International Study Center worked closely with organizations that were responsible for particular aspects of the study, the PIRLS advisory committees, and representatives of the participating countries. In the IEA Secretariat, Hans Wagemaker was responsible for overseeing fundraising and country participation. Barbara Malak, also of the IEA Secretariat, was responsible for managing the ambitious translation verification effort and for recruiting international quality control monitors. Statistics Canada worked with countries to ensure that the international sampling procedures were followed, adapted the international design to national conditions, documented the national samples, and computed sampling weights. The National Foundation for Educational Research in England and Wales had major responsibility for developing the reading test, including collecting reading passages, developing items and scoring guides, and conducting scoring training. The IEA Data Processing Center was responsible for processing and verifying the data from the 35 countries, and for constructing the international database.

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The PIRLS 2001 Reading Development Group (RDG) contributed their invaluable expertise to developing and reviewing the framework and reading test. The RDG also worked with the PIRLS Reading Coordinator, NFER, and ISC staff members to develop the descriptions of achievement at international benchmarks. The PIRLS 2001 Questionnaire Development Group (QDG) helped develop the PIRLS questionnaires, including writing items and reviewing drafts of all questionnaires.

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The PIRLS 2001 National Research Coordinators (NRCs) were responsible for the crucial task of implementing the study in their countries. They participated in every aspect of the work to ensure that the study was of high quality.

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