Appendix C

Items with the Largest Gender Difference Index (GDI)

Exhibit C.1 Items with the Largest Gender Difference Index (GDI) in Mathematics
Fourth Grade*

Male Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Finds the time an event started given its duration and end time	10 (1.0)	15	0
Locates a point on a rectangular grid by following specified moves	9 (1.5)	7	0
Solves one-step multiplication problem involving rate	9 (1.1)	16	0
Finds the increase in temperature from a negative to a positive temperature on a thermometer	9 (0.7)	14	0
Writes a number that is 1,000 more than a given five-digit number	9 (0.8)	12	0
Estimates the distance on a map given scale (in cm = km)	8 (0.8)	16	0
Solves one-step multiplication problem involving rate	7 (1.1)	6	0
Uses proportional reasoning to solve a word problem involving halves	7 (1.4)	7	0
Knows that there is a better chance of landing on a shaded part of an area when a greater part of that area is shaded	7 (1.4)	3	0
Recognizes the inverse relationship between size of unit and number of units required to cover a distance	7 (1.5)	3	0
Solves a problem counting backwards or subtracting across a hundred point	7 (0.9)	7	0

Female Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Adds two four-digit numbers involving three regroupings	-8 (1.7)	0	3
Solves a comparison problem by associating elements of a bar graph with a verbal description	-7 (0.8)	0	15
Reads information from a simple bar graph	-7 (1.2)	0	9
Arranges four digits into two two-digit numbers whose sum is greater than a given number (in the context of a game)	-7 (1.2)	0	7
Shows that a ratio of 10:20 is equivalent to 1:2 using words or pictures	-7 (1.3)	0	7
Recognizes same pattern of sequence of shapes when made with different shapes	-6 (1.5)	0	2
Identifies next terms in an alternating number pattern involving counting forward and backward by ones	-5 (0.8)	0	5
Subtracts two four-digit numbers involving multiple regrouping and 0s	-5 (1.9)	0	3
Subtracts two decimals involving hundredths with regrouping over 0	-5 (0.9)	0	5
Uses numerical data from a table to draw sets of double bars to complete a bar graph	-5 (1.4)	0	3

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

* Fourth grade in most countries; see Appendix A for information about the grades tested in each country.

Exhibit C.2 Items with the Largest Gender Difference Index (GDI) in Mathematics
Eighth Grade*

Male Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Sets up the correct proportion in a word problem, and solves for the missing term	12 (0.3)	31	0
Calculates the percent of increase in price in a word problem	11 (1.2)	17	1
Solves a one-step word problem involving division of a whole number by a unit fraction	11 (1.1)	18	0
Identifies the smallest of a set of decimals with differing number of places	9 (0.8)	25	0
Applies knowledge of number of milliliters in a liter to solve a word problem	9 (1.1)	13	0
Solves word problem involving the percent of increase and estimation	8 (1.2)	11	0
Selects the smallest fraction from a set of familiar fractions	8 (0.8)	18	0
Solves a word problem by reading information from a graph of a non-linear relationship	8 (1.2)	8	0
Compares volume by visualizing and counting cubes	8 (0.6)	21	0
In a word problem, solves for a missing number using proportional reasoning	8 (0.7)	18	0
Recognizes that the precision of measurement is related to the size of the unit of measurement	8 (0.6)	21	0
Solves a word problem by extrapolating a graph of a non-linear relationship	8 (1.0)	7	0

Female Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Subtracts to three decimal points using multiple regrouping	-11 (1.2)	0	13
Solves a comparison problem by associating elements of a bar graph with a verbal description	-11 (1.4)	0	10
Recognizes same pattern of sequence of shapes when made with different shapes	-8 (1.7)	1	7
Subtracts one four-digit number from another in a problem involving multiple regrouping and 0s	-8 (1.6)	1	5
Solves one-step subtraction word problem involving two numbers with decimals to the hundredth	-8 (1.3)	0	8
Solves a problem involving terms common to two arithmetic sequences	-7 (1.1)	0	10
Decides whether estimate or exact value is appropriate in a situation involving money	-7 (1.0)	0	10
Adds three fractions with unlike denominators	-7 (1.2)	0	9
Divides one fraction by another fraction	-6 (1.2)	0	7
Identifies corresponding parts of congruent triangles	-6 (0.6)	0	15
Adds and multiplies fractions by applying rules of order of operations	-6 (1.0)	0	9
Identifies algebraic expressions corresponding to a verbal description	-6 (1.1)	0	6
Finds the value of an algebraic expression in one variable by substituting a given value for the variable	-6 (1.1)	0	6

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

Exhibit C.3 Items with the Largest Gender Difference Index (GDI) in Mathematics Literacy
Final Year of Secondary School*

Male Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Translates graphical information into a mathematical expression	17 (1.2)	13	0
Uses the concepts of volume and proportionality to solve a word problem	16 (1.0)	16	0
Recognizes when a graphical presentation of data has been distorted	15 (1.5)	10	0
Solves an addition problem involving negative numbers	15 (1.3)	15	0
Multiplies fractions by fractions to solve a word problem	15 (1.1)	17	0
Demonstrates the ability to estimate area in order to solve a word problem	14 (1.1)	16	0
Uses the concept of volume to solve a word problem	13 (1.0)	14	0
Understands how percentage increases and decreases affect pricing	13 (1.2)	14	0
Knows how to translate fractions into percentages	13 (1.3)	11	0
Understands the impact of width on changes in volume	12 (1.3)	9	0
Knows how to convert distances in the metric system	12 (1.0)	15	0
Uses the concept of rate to estimate the time it will take to fill a tank	12 (1.1)	11	0

Female Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
None	- -	-	-

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

* See Appendix A for information about the grades tested in each country.

Exhibit C.4 Items with the Largest Gender Difference Index (GDI) in Advanced Mathematics
Final Year of Secondary School*

Male Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Calculates the length of a string wrapped around a rod given the length and circumference of the rod	30 (2.8)	9	0
Uses graphical information to determine differential values of x	21 (3.6)	6	0
Calculates the limit of the perimeter of a polygon of n sides inscribed in a circle of fixed radius	21 (2.5)	9	0
Uses spatial rotation to solve a graphical problem	19 (2.2)	9	0
Knows how to calculate the overall average based on two samples of unequal size with unequal averages	19 (2.4)	8	0
Calculates the height of a mountain based upon the angle and the average speed of a cable car	18 (2.6)	8	0
Calculates the angle between two vectors	17 (2.5)	9	0
Determines all complex numbers solving a given equation	15 (2.6)	4	1
Uses the concept of exponential growth to solve a word problem	13 (2.0)	7	0
Calculates the sum of an infinite geometric series	13 (2.7)	6	0
Calculates joint probability	13 (2.3)	6	0
Calculates the distance between intercepts on a plane	13 (2.7)	6	0
Calculates the equation of a function given the derivative	13 (2.4)	5	0
Calculates the length of a diagonal in a regular hexagon	13 (2.0)	4	0

Female Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
None	- -	-	-

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

* See Appendix A for information about the grades tested in each country.

Exhibit C.5 Items with the Largest Gender Difference Index (GDI) in Science
Fourth Grade*

Male Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Recognizes that the speed of light is faster than that of sound, airplanes or trains	21 (1.3)	21	0
Demonstrates some understanding of fluid properties by drawing the liquid surface on a frame-of-reference diagram depicting a rotated container	16 (1.4)	17	0
Recognizes most of Earth's surface is covered by water	10 (0.5)	19	0
Interprets pictorial diagram depicting angle/length of shadows at different times of day and selects the shadow cast at mid-day	9 (0.9)	16	0
Applies knowledge of the relationship between fire/burning and air/oxygen to explain why a covered flame goes out	9 (1.3)	4	0
From a list of familiar animals, identifies the animal that eats only plants	9 (1.5)	7	1
Interprets diagram and identifies change in buoyancy of object when placed in fresh and salt water	8 (1.2)	7	1
Applies knowledge of levers (seesaws) to interpret a diagram and identify the conditions (weights/lever arms) required to balance a seesaw	8 (1.2)	6	0
From a diagram comparing masses on a scale, reasons to a conclusion to determine the heaviest of three objects	8 (1.0)	10	0
Recognizes the energy sources in a list of sources and non-sources	8 (1.3)	7	0

Female Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Provides one reason animals need plants to survive	-7 (1.1)	0	8
Recognizes that people use sunscreen to protect the skin from the sun's radiation	-7 (1.4)	0	4
Identifies the order of developmental stages of a plant based on pictorial representations	-7 (1.7)	0	5
From a list of familiar edible and inedible plants, identifies a plant not grown for food	-6 (0.7)	0	14
Describes one effect of environmental change (temperature) on aquatic life	-6 (0.9)	0	10
Recognizes that washing hands removes germs to prevent illness	-6 (1.2)	0	3
Specifies the order of developmental stages of a frog based on pictorial representations	-5 (1.4)	1	5
Demonstrates knowledge of environmental effects by writing a cannot be predicted exactly	-5 (1.1)	0	5
Recognizes that weather and occurrences of natural disasters cannot be predicted exactly	-5 (0.7)	0	8
Writes down one example of computer uses for work description of one way oil spills harm the environment	-5 (1.1)	0	3
Recognizes that an animal's breathing/heart rate may increase when it is frightened	-5 (1.2)	0	3
Recognizes that sunlight and rain are required to cause rainbows	-5 (1.2)	0	4
Identifies the butterfly as the adult stage of the caterpillar	-5 (2.2)	0	2

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

* Fourth grade in most countries; see Appendix A for information about the grades tested in each country.

Exhibit C.6 Items with the Largest Gender Difference Index (GDI) in Science
Eighth Grade*

Male Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Demonstrates some understanding of fluid properties by drawing the liquid surface on a frame-of-reference diagram depicting a rotated container	21 (0.9)	32	0
Identifies a ray diagram depicting light passing through a magnifying lens	18 (0.6)	32	0
Applies concept of electrical circuits and knowledge of conductors/insulators to interpret diagrams and identify complete circuits made with components of different materials (metals, air, rubber)	17 (1.2)	20	0
Interprets a diagram of the earth's layers and identifies the center as the hottest	14 (0.9)	27	0
Applies knowledge of the need for oxygen/air for burning to explain why a carbon dioxide extinguisher extinguishes a fire	13 (0.9)	21	0
Recognizes that burning wood releases energy	13 (0.6)	28	0
Recognizes proportional relationship between voltage and current (Ohm's Law) and provides missing information to complete a voltage/current table	13 (1.0)	23	0
Interprets a contour map and identifies direction of river flow from higher to lower elevation	13 (0.6)	30	0
Applies knowledge of circular motion and interprets diagram to identify that an object will move in a straight line when released a circular path from	12 (0.9)	18	0
Recognizes that the moon is visible because of reflected sunlight	12 (0.8)	26	0
Recognizes the relationship between global warming and the increase in carbon dioxide levels in the atmosphere	12 (0.6)	32	0
Identifies the diagram depicting the correct arrangement of batteries in a flashlight	12 (0.9)	17	0

Female Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Recognizes that a human inherits traits from both parents	-10 (0.9)	0	21
Recognizes that traits are transferred to offspring through the sperm and egg	-8 (0.8)	0	15
Extracts relevant information from a data table of planetary conditions to draw a conclusion and describe a condition hostile to human life	-8 (1.3)	1	7
Identifies the meal with the most nutrients	-8 (1.2)	0	10
Recognizes the nutritional value of fruits and vegetables as a source of vitamins and minerals	-8 (1.3)	0	6
Demonstrates knowledge of contagious disease by describing one way that influenza may be caught	-8 (1.1)	0	6
From a list of organs, identifies the heart as the organ not situated in the abdomen	-7 (0.5)	2	18
Recognizes that repeated scientific measurements should produce similar but not identical results	-6 (1.0)	1	9
Describes at least a partial procedure for investigating the effect of exercise on heart rate (includes at least 2 of 3 required elements: pre- and post-measurements, exercise step, and use of timing device)	-5 (1.2)	0	10
Describes one reason for the uneven availability of water resources for human usage	-5 (1.1)	0	4

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

Exhibit C.7 Items with the Largest Gender Difference Index (GDI) in Science Literacy
Final Year of Secondary School*

Male Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Understands the relationship between distance and perceived size of an object	25 (0.8)	19	0
Understands the law of conservation of energy	22 (1.4)	17	0
Identifies a practical example of energy changing states	19 (0.9)	19	0
Explains the relationship between mass, acceleration, and force	19 (0.9)	19	0
Identifies how carbon dioxide causes the greenhouse effect	14 (0.9)	16	0
Understands the concept of leverage as appled to a scale	14 (0.8)	19	0
Identifies how a battery works with a light bulb	13 (1.0)	16	0
Identifies one of the principal causes of acid rain	13 (0.9)	15	0
Can draw a diagram of the water cycle	13 (1.2)	12	0
Understands the concept of radioactive half-life	11 (0.9)	14	0

Female Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Can explain how blood types interact with one another	-8 (1.4)	0	5
Demonstrates knowledge of contagious disease by describing one way that influenza may be caught	-8 (1.1)	0	6
Identifies the meal with the most nutrients	-6 (1.6)	0	6
Recognizes that traits are transferred to offspring through the sperm and egg	-5 (1.4)	0	5
Recognizes the nutritional value of fruits and vegetables as a source of vitamins and minerals	-5 (1.6)	0	3

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

* See Appendix A for information about the grades tested in each country.

Exhibit C.8 Items with the Largest Gender Difference Index (GDI) in Physics
Final Year of Secondary School*

Male Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Can explain how to set up an experiment to test a scientific hypothesis	27 (2.7)	9	0
Calculates the tension in thread between two points	27 (1.1)	13	0
Explains why a television is a particle accelerator	27 (3.0)	8	0
Interprets graphical information based on experimental data	26 (2.7)	11	0
Diagrams the direction of motion based on wave propagation	25 (2.8)	10	0
Uses graphical information to help interpret the velocity of light	24 (2.8)	10	0
Demonstrates understanding of the concept of magnetism to solve a word problem	23 (5.6)	6	0
Diagrams the path of alpha particles, gamma rays, and electrons	22 (3.1)	7	0
Solves a word problem requiring knowledge of spring force	21 (2.9)	6	0
Knows how the speed of light is affected by passing through certain materials	20 (1.4)	12	0
Can diagram acceleration and momentum based on a word problem	20 (3.8)	5	0

Female Higher-Performing Items Item Label	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Identifies the cause of Frauhofer lines	-5 (2.2)	0	1

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

* See Appendix A for information about the grades tested in each country.