



Table of contents

FOREWORD	3
OVERVIEW	9
CHAPTER 1 PISA 2006 AND STUDENTS' PERFORMANCE IN ENVIRONMENTAL SCIENCE AND GEOSCIENCE	13
Introduction	14
The Programme for International Student Assessment (PISA)	15
▪ PISA, an overview	15
▪ Focus on students' science performance	17
Environmental science education: A conceptual framework	17
Environmental science performance in PISA 2006	18
Organisation of this report	19
CHAPTER 2 A PROFILE OF STUDENT PERFORMANCE IN ENVIRONMENTAL SCIENCE AND GEOSCIENCE	21
Measures of performance in environmental science and geoscience	22
Main results of this chapter	22
Environmental science and geoscience performance indices in PISA 2006	22
▪ A definition of performance in environmental science and geoscience within the PISA 2006 science framework	22
▪ Constructing the environmental science and geoscience performance indices and proficiency levels	24
▪ Constructing adjusted proficiency levels for the environmental science and geoscience performance indices	26
▪ Examples of tasks that students can do at each of the proficiency levels	26
How do students perform in the environmental science and geoscience indices?	36
▪ Student performance at the highest level of environmental science proficiency	36
▪ Student performance at the lowest level of environmental science proficiency	37
▪ Student performance in geoscience	37
▪ Student average performance on the environmental science and the geoscience indices	40
Student characteristics and performance in environmental science and geoscience	41
▪ Gender	41
▪ Immigrant background	42
▪ Socio-economic background	43
Student performance: conclusions and implications	43



CHAPTER 3 MAKING CONNECTIONS AND TAKING RESPONSIBILITY	45
Student attitudes and learning about the environment	46
Main results of this chapter	47
PISA and student attitudes towards environmental issues	47
Students' familiarity with, responsibility for, and optimism toward general environmental issues	49
▪ Overall results	49
▪ Air Pollution	50
▪ Energy shortages	50
▪ Extinction of plants and animals	54
▪ Clearing of forests for other land use	54
▪ Water shortage	54
▪ Nuclear waste	55
Students' awareness and self-perception of their ability to understand complex environmental challenges	55
Are students' characteristics related to their attitudes towards the environment?	57
▪ Parents' attitudes towards the environment	57
▪ Gender differences in attitudes towards resources and the environment	58
▪ Socio-economic background and attitudes towards resources and the environment	58
▪ Immigrant background and attitudes towards resources and the environment	59
Are attitudes related to the environmental science performance index?	59
▪ Students' sense of responsibility towards environmental issues	59
▪ Students' optimism regarding environmental issues	61
▪ Students' awareness of complex environmental issues	61
Student attitudes: conclusions and implications	61
CHAPTER 4 LEARNING ABOUT ENVIRONMENTAL SCIENCE AND GEOSCIENCE	65
Schools and environmental science education	66
Main results of this chapter	66
Environmental science and geoscience in the school science curriculum	67
Out-of-classroom activities to promote learning of environmental science in schools	69
Sources for learning about environmental issues	71
▪ Sources of knowledge and performance in the environmental science index	75
Learning about the environment: conclusions and implications	75
REFERENCES	79
APPENDIX A DATA TABLES	81
APPENDIX B TECHNICAL NOTES	113
READER'S GUIDE	115



LIST OF BOXES

Box 3.1	The OECD Survey on Household Environmental Behaviour	46
Box 3.2	Actual questions towards environmental issues.....	48
Box 3.3	Interpreting PISA attitudinal data.....	50
<hr/>		
Box 4.1	Environmental questions	67
Box 4.2	The school building as a teacher	72

LIST OF FIGURES

Figure 1.1	A map of PISA countries and economies.....	16
<hr/>		
Figure A	Greenhouse	27
Figure B	Grand Canyon.....	32
Figure C	Acid Rain	34
Figure 2.1	Percentage of students at each proficiency level on the environmental science performance index.....	36
Figure 2.2	Percentage of students at each proficiency level on the geoscience performance index	38
Figure 2.3	Gender differences in the environmental science performance index	41
Figure 2.4	Differences between native students and students with an immigrant background in the environmental science performance index	42
Figure 2.5	Performance on the environmental science index by quarters of the PISA index of social, economic and cultural status (ESCS).....	43
<hr/>		
Figure 3.1	Students' familiarity with environmental issues.....	51
Figure 3.2	Index of students' sense of responsibility for environmental issues	52
Figure 3.3	Index of students' optimism regarding environmental issues.....	53
Figure 3.4	Index of students' awareness of more complex environmental issues.....	56
Figure 3.5	Parents' sense of responsibility for environmental issues.....	57
Figure 3.6	Parents' optimism regarding environmental issues.....	58
Figure 3.7	Relationship between students' attitudes and environmental science performance after accounting for student and school background.....	60
<hr/>		
Figure 4.1	Placement of environmental topics in the school curriculum	68
Figure 4.2	Outside classroom learning activities for environmental science.....	70
Figure 4.3	Main sources for students to learn about environmental issues in the OECD.....	74
Figure 4.4	Relationship between sources of students' knowledge about extinction of plants and animals and environmental science performance after accounting for background variables.....	76

LIST OF TABLES

Table 1.1	PISA 2006 knowledge of science categories.....	18
Table 1.2	Contexts for the PISA 2006 science assessment	19
<hr/>		
Table 2.1	The environmental science performance index within the PISA science framework.....	23
Table 2.2	Proficiency levels on the environmental science and geoscience performance indices.....	25
Table 2.3	Multiple comparisons of mean performance on the environmental science performance index.....	39



TABLE OF CONTENTS

Table A2.1	Percentage of students by proficiency level in the environmental science performance index.....	82
Table A2.2	Percentage of students by proficiency level in the geoscience performance index	83
Table A2.3	Mean score on the environmental science performance index and on the geoscience performance index, by gender.....	84
Table A2.4	Mean score on the environmental science performance index and on the geoscience performance index, by students' immigrant background.....	85
Table A2.5	Performance on the environmental science index and on the geoscience index, adjusted by the PISA index of economic, social and cultural status (ESCS) and by quarters of the index of ESCS	86
<hr/>		
Table A3.1	Students' familiarity with environmental issues.....	88
Table A3.2	Index of students' sense of responsibility for environmental issues	89
Table A3.3	Index of students' optimism regarding environmental issues.....	90
Table A3.4	Index of students' awareness of more complex environmental issues.....	91
Table A3.5	Parents' sense of responsibility for environmental issues.....	92
Table A3.6	Parents' optimism regarding environmental issues.....	92
Table A3.7	Relationship between parents' and students' attitude towards environmental issues	92
Table A3.8	Effect sizes for gender differences (females minus males) in environmental science attitude indices.....	93
Table A3.9	Effect sizes for the difference between the top and bottom quarters of the PISA index of economic, social and cultural status (ESCS) for environmental science attitude indices	94
Table A3.10	Effect sizes for the difference between students with an immigrant background and native students for environmental science attitude indices.....	95
Table A3.11	Correlation between performance, attitudes and socio-economic background indices.....	96
Table A3.12	Relationship between student and school background factors and the environmental science performance index.....	96
Table A3.13	Relationship between student and school demographic and socio-economic background factors and the environmental science performance index, by country	97
Table A3.14	Relationship between students' attitudes towards environmental issues and the environmental science performance index, by country	99
<hr/>		
Table A4.1	Placement of environmental topics in the school curriculum.....	100
Table A4.2	Relationship between curriculum placement of environmental issues and environmental science performance, by country.....	101
Table A4.3	Outside classroom learning activities for environmental science.....	102
Table A4.4	Relationship between school activities for learning of environmental topics and environmental science performance, by country.....	103
Table A4.5	Main sources for students to learn about environmental issues.....	105
Table A4.6	Relationship between sources of students' knowledge about the extinction of plants and animals and the environmental science performance index, by country	111