



PISA 2006 SCIENCE: EVERYDAY EXPLANATIONS AND STUDENT INTEREST IN BIOLOGICAL EVOLUTION

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INTRODUCTION

STUDENTS' EVERYDAY CONCEPTIONS

- Early work of Rosalind Driver
- Continuing work of Robin Millar & Andree Tiberghien, John Leach, Phil Scott, Edith Guesne, Ann Squires, Peter Rushworth, Valerie Wood-Robinson
- Compiling bibliographies of work by Reinders Duit
<http://www.ipn.uni-kiel.de/aktuell/stcse/stcse.html>



PISA 2006 SCIENCE

Focus Units

Developed by Rolf Olsen and Svein Lie
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Covering Ideas Such As

Heat and Temperature, Structure of Matter, Earth in Space

AND

BIOLOGICAL EVOLUTION



PISA 2006 SCIENCE

Embedded Attitudinal Test Items

Covering Attitudes Such As

Interest in Learning About Specific Topics
Associated with the Unit Contexts

and

Support for the Role of Scientific Inquiry
in the Unit Contexts



THE CHEETAH



**Students' Understanding of Biological Evolution Concepts
The Cheetah (Main Survey)**

Biological Explanation	All Countries	Non-OECD Countries	OECD Countries	OECD Male	OECD Female
Genetic inheritance and environmental differences explain why cheetahs are not identical (correct response 2 items combined—overall percentage)	43.9%	44.6%	43.2%	43.3%	43.2%

**Students' Understanding of Biological Evolution vs.
Everyday Explanations
The Cheetah (Main Survey)**

Biological Explanation (correct answer-c)	All Countries	Non-OECD Countries	OECD Countries	OECD Male	OECD Female
Fast cheetahs catch more prey and raise more cubs	23.8%	22.0%	25.5%	25.8%	25.3%
Everyday Explanation (incorrect answer-b)					
Cheetahs learnt to run fast to catch prey	56.1%	59.0%	53.4%	51.5%	55.5%



EVOLUTION

Students' Understanding of the Basis for the Theory of Biological Evolution Evolution (Field Trial)

Scientific Explanation (correct response-c)	All Countries	Non-OECD Countries	OECD Countries	OECD Male	OECD Female
Evolution is a theory that is currently based on numerous observations	45.0%	41.6%	48.7%	46.7%	49.0%
Everyday Explanation (incorrect response-d)					
Evolution is a theory that has been proven to be true by scientific experiments	40.0%	41.1%	39.2%	38.1%	40.1%

STUDENTS' HIGH-MEDIUM INTEREST IN TOPICS RELATED TO BIOLOGICAL EVOLUTION

The Cheetah (Main Survey)

Potential Topic of Study	All	Non-OECD Countries	OECD Countries	OECD Male	OECD Female
a Learning more about the inheritance of distinguishing characteristics	63.6%	63.9%	63.4%	60.5%	66.3%
b Learning what factors influence changes in species over long periods of time	66.9%	68.1%	65.7%	64.8%	66.7%
c Understanding how genetic mutations (changes) take place in animals	71.0%	72.3%	69.8%	69.0%	70.5%

STUDENTS' STRONGLY AGREE-AGREE SUPPORT OF SCIENTIFIC STUDY RELATED TO BIOLOGICAL EVOLUTION

The Cheetah (Main Survey)

Potential Support	All	Non-OECD Countries	OECD Countries	OECD Male	OECD Female
a It is important to investigate why particular animal species have become extinct.	92.6%	92.5%	92.7%	91.3%	94.2%
b Even small changes within particular species deserve careful study.	81.0%	83.5%	78.7%	76.8%	80.7%
c Scientific evidence is necessary to decide whether a species is threatened with extinction.	79.9%	79.2%	80.5%	79.2%	81.9%

STUDENTS' HIGH-MEDIUM INTEREST IN INFORMATION RELATED TO BIOLOGICAL EVOLUTION

Evolution (Field Trial)

Potential Interest	All	Non-OECD Countries	OECD Countries	OECD Male	OECD Female
a Know how fossils can be identified	68.1%	72.8%	63.8%	62.2%	65.3%
b Learning more about the development of the theory of evolution	65.9%	69.5%	62.5%	61.9%	63.2%
c Understanding better the evolution of the present-day horse	51.4%	59.4%	43.9%	38.3%	49.2%



CONCLUSION

Based on this exploration, the following conclusions seem reasonable.

- Everyday explanations (i.e., misconceptions) account for student errors on test items, regardless of their performance on the rest of the test.
- Student interest in biological evolution and related topics (e.g., fossils, extinction) suggest an opportunity to change everyday ideas to scientifically accurate concepts.
- Students' interest in topics related to evolution and the nature of science (e.g., scientific experiments and explanations) suggest an opportunity to improve students' knowledge about science.

The findings of this exploration also support further research and analysis for other focus units from the field test of PISA 2006 Science; for example, topics such as structure of matter, heat and temperature, and knowledge *about* science.