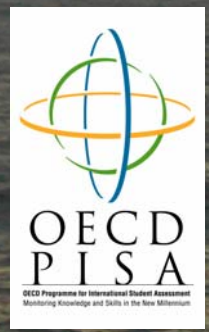
Scientific literacy of HK students

Implications for curriculum & instruction



What is scientific literacy ?

The capacity to:

- use scientific knowledge
- recognise scientific questions
- draw evidence-based conclusions

⇨ to understand and make decisions about the natural world.

Items for assessing scientific literacy:

• Use scientific knowledge.	16
• Recognise scientific questions.	3
• Identify evidence.	10
• Draw or evaluate conclusions.	5
• Communicate ide s/conclusions.	

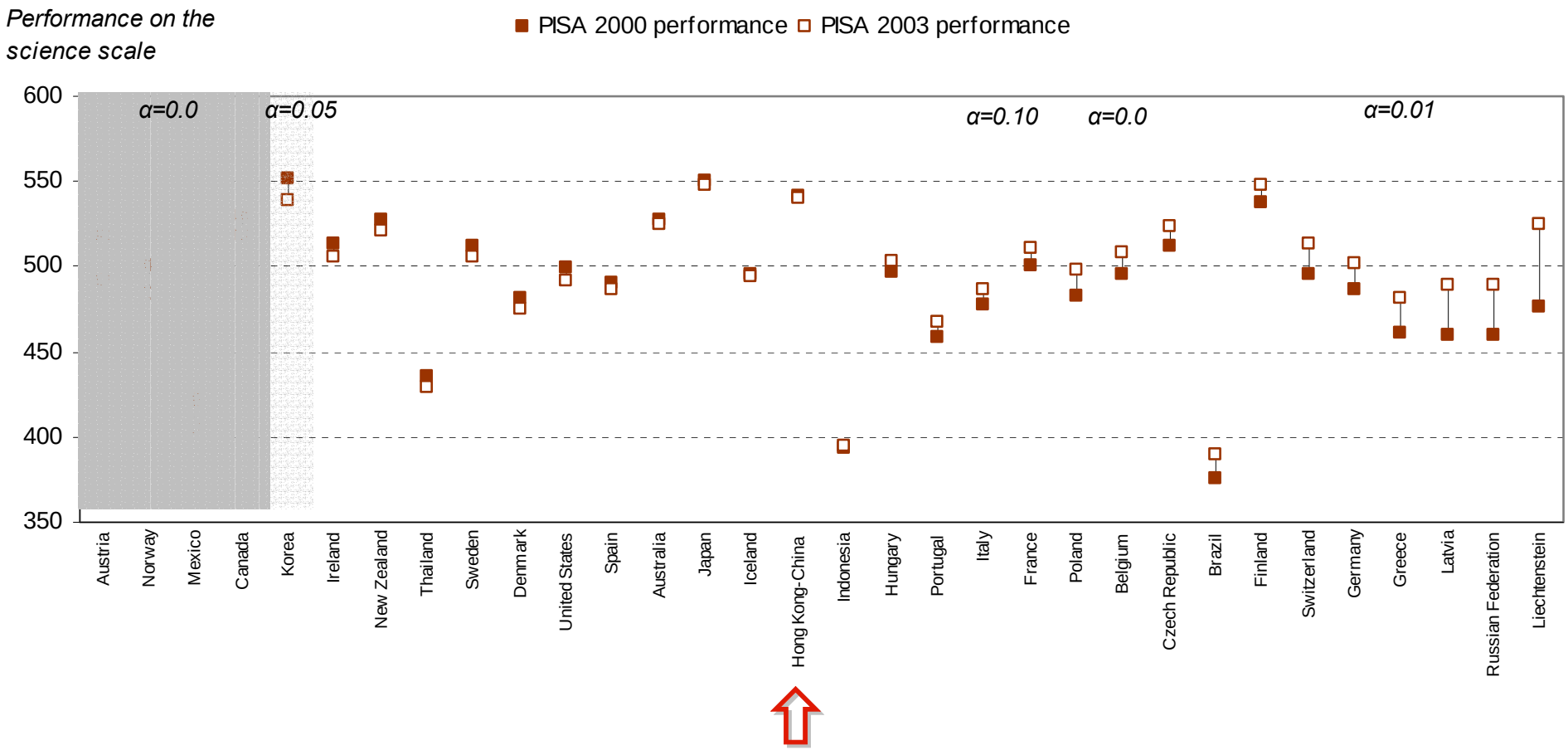
Processes of scientific inquiry

Set in real-life situations

- 13 assessment tasks ⇨ 34 items

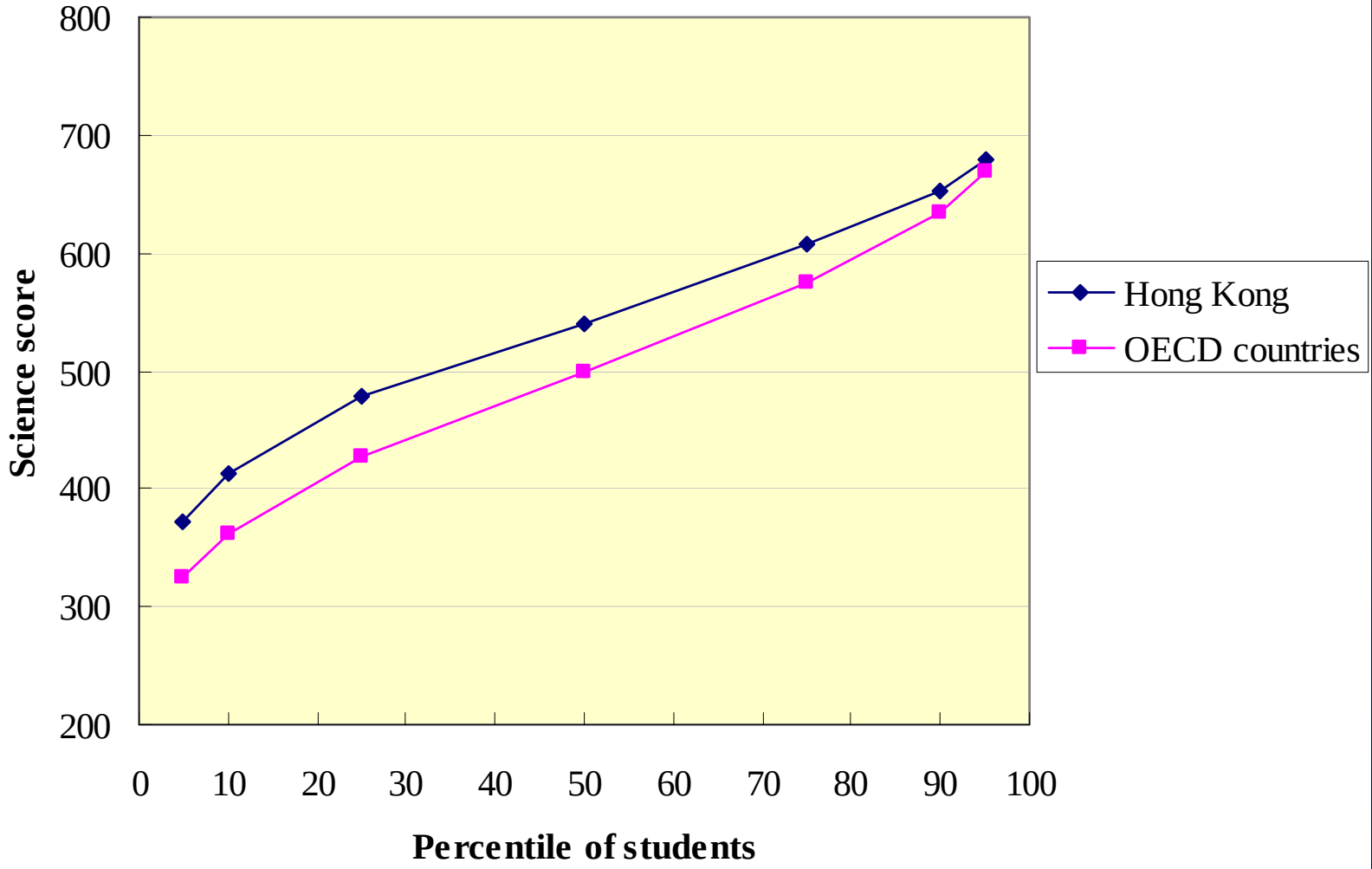
Marking with 2-digit codes

Performance of HK students in scientific literacy



Percentile	Hong Kong	OECD average	Difference (HK–OECD)
5th	373	324	49
10th	412	362	50
25th	478	427	51
50th	539	500	39
75th	608	575	33
90th	653	634	19
95th	680	668	12

Student scores at different percentiles



Lower achievers of Hong Kong are less disadvantaged in scientific literacy.

Implications for curriculum & instruction ?

OECD PISA
OECD Programme for International Student Assessment
Monitoring Knowledge and Skills in the New Millennium

Majority of HK schools are supported by the government with equal funding & resources.

ALA schools are not disadvantaged in terms of supply of qualified teachers, supporting staff and equipment.

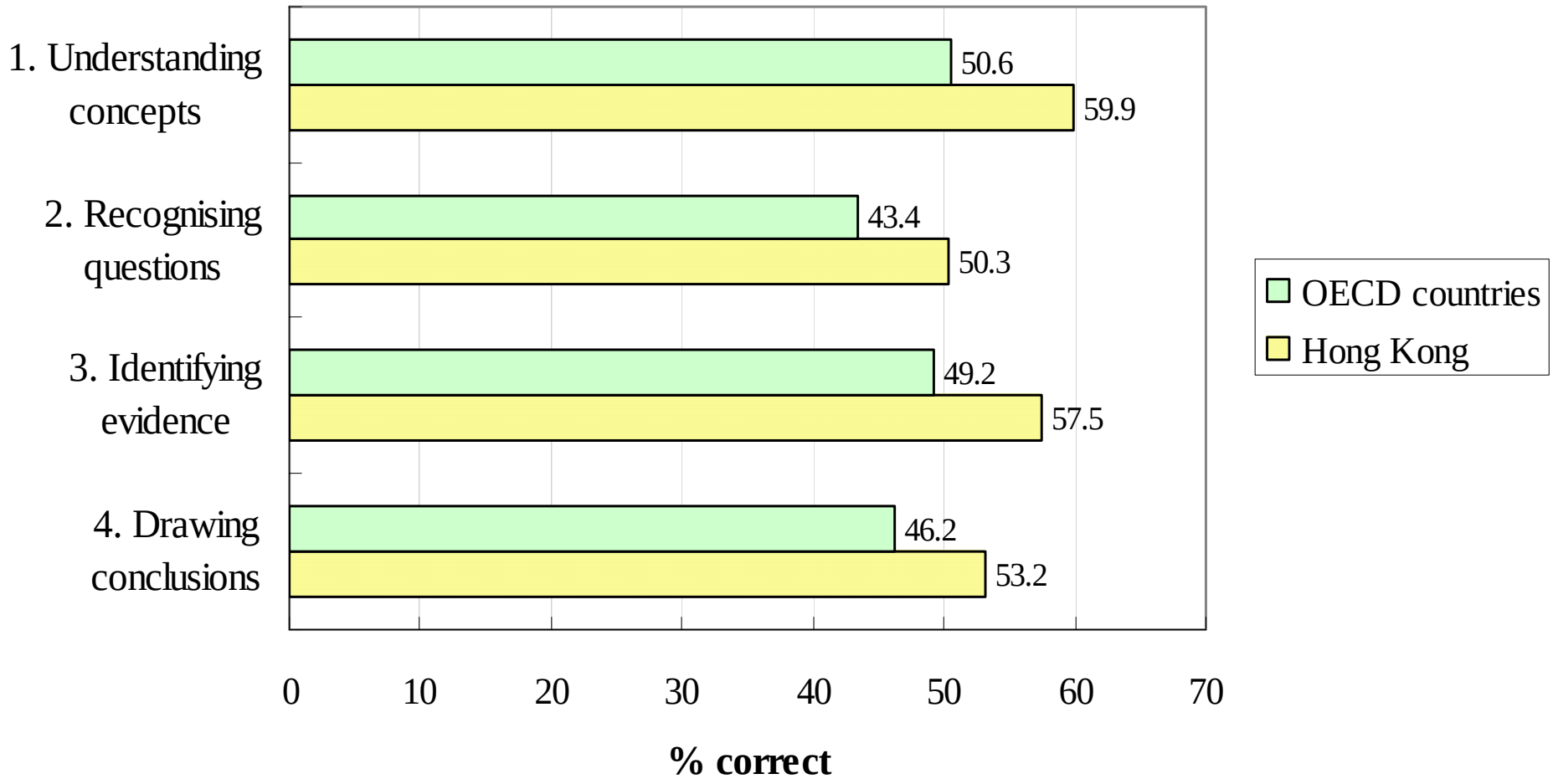
Science curriculum –
core & extension components

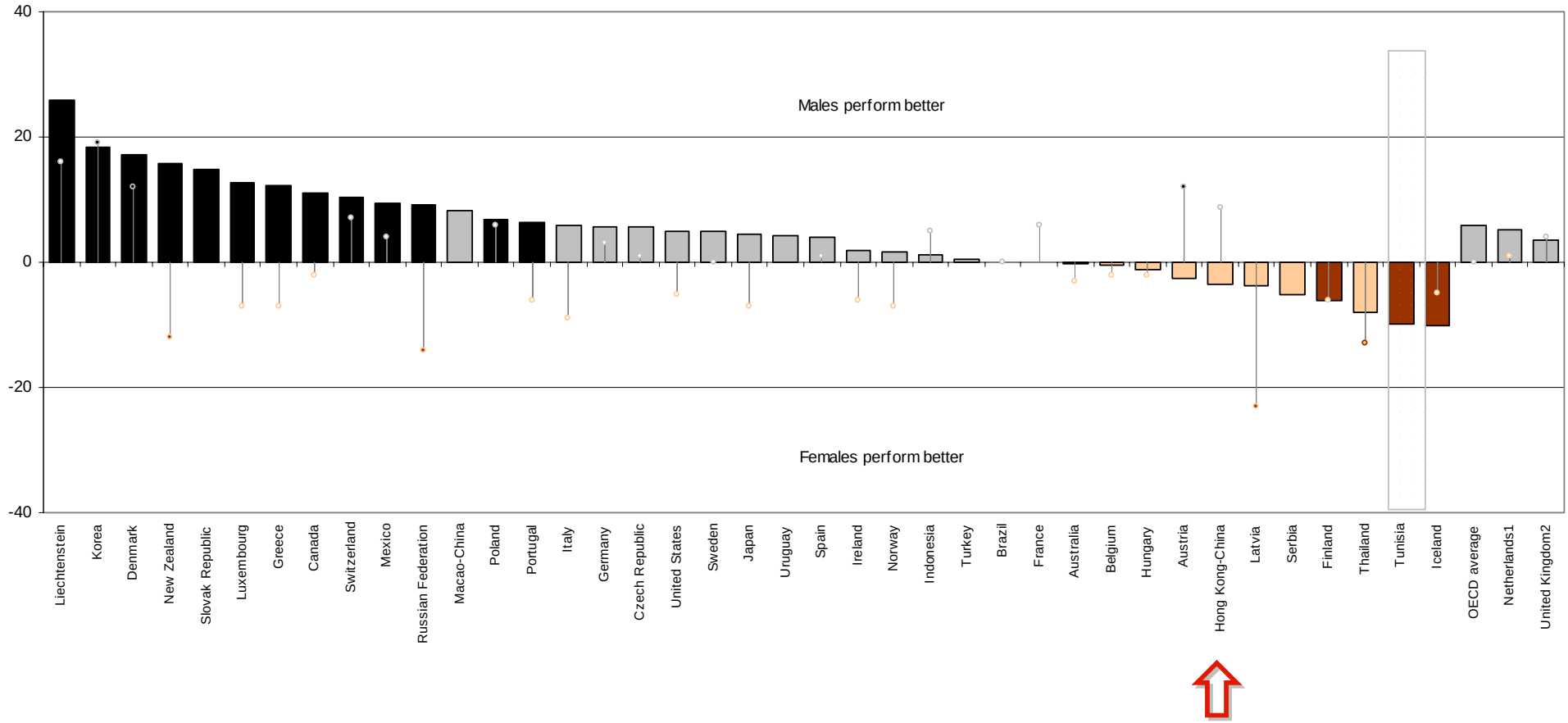
ALA schools

Additional support from EMB and other organisations (CUSP) in various ways:

- Design and implementation of school-based curriculum
- Development of teaching skills that facilitate the learning of low achievers
- Greater emphasis on learning & thinking skills

Performance in different components of scientific literacy

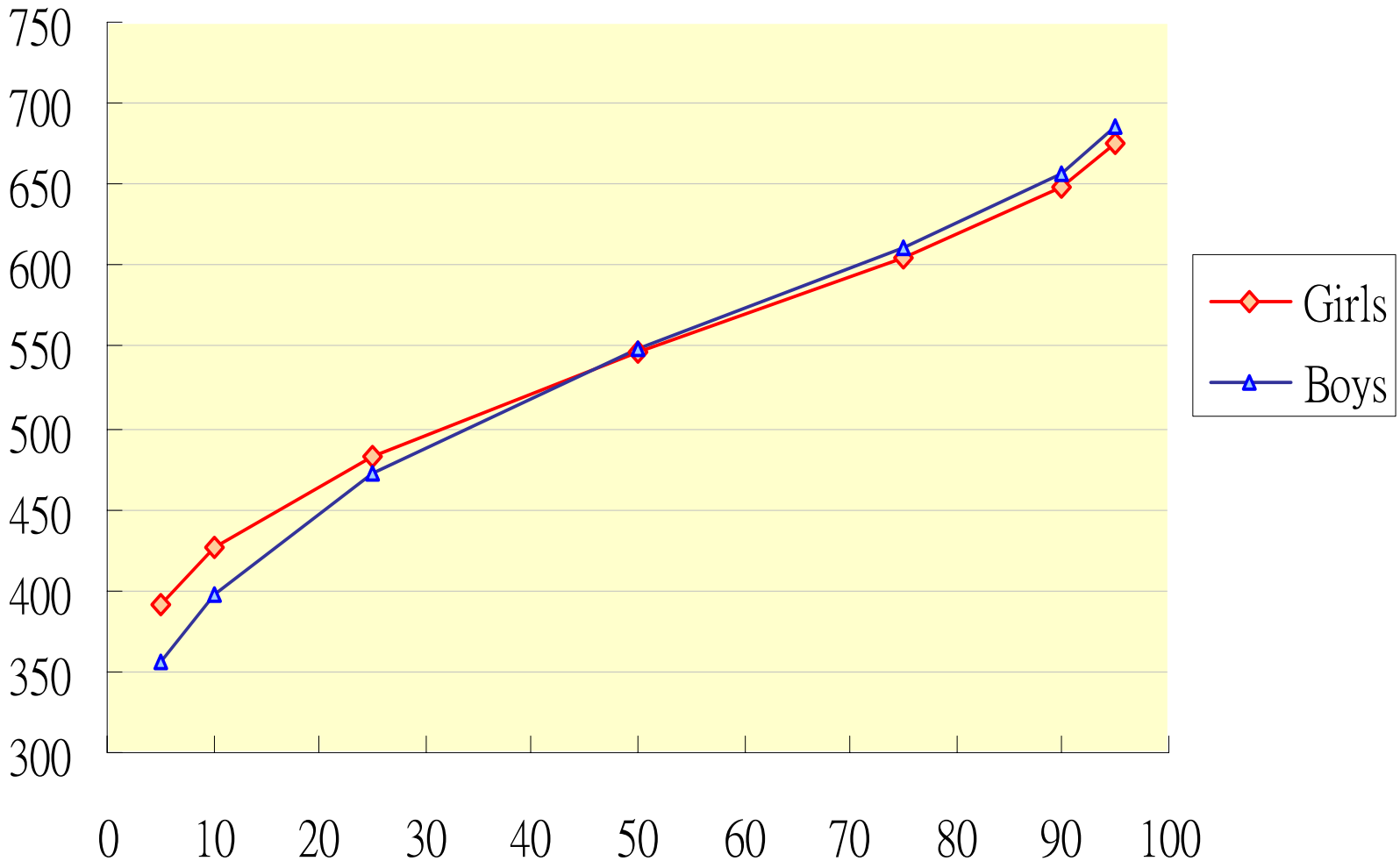



40
20
0
-20
-40
Males perform better
Females perform better
Liechtenstein
Korea
Denmark
New Zealand
Slovak Republic
Luxembourg
Greece
Canada
Switzerland
Mexico
Russian Federation
Macao-China
Poland
Portugal
Italy
Germany
Czech Republic
United States
Sweden
Japan
Uruguay
Spain
Ireland
Norway
Indonesia
Turkey
Brazil
France
Australia
Belgium
Hungary
Austria
Hong Kong-China
Latvia
Serbia
Finland
Thailand
Tunisia
Iceland
OECD average
Netherlands1
United Kingdom2

Performance of Hong Kong girls and boys in different percentiles

Percentile	Girls		Boys		Difference of the means
	Mean	S.E.	Mean	S.E.	
5th	391	8.3	356	11.8	34*
10th	427	7.2	398	11.4	29*
25th	483	6.6	472	9.3	11
50th	547	5.0	549	6.4	-1
75th	604	3.9	611	4.9	-7
90th	649	3.7	657	5.4	-8
95th	675	4.5	685	7.0	-10
Total	541	4.2	538	6.1	-3

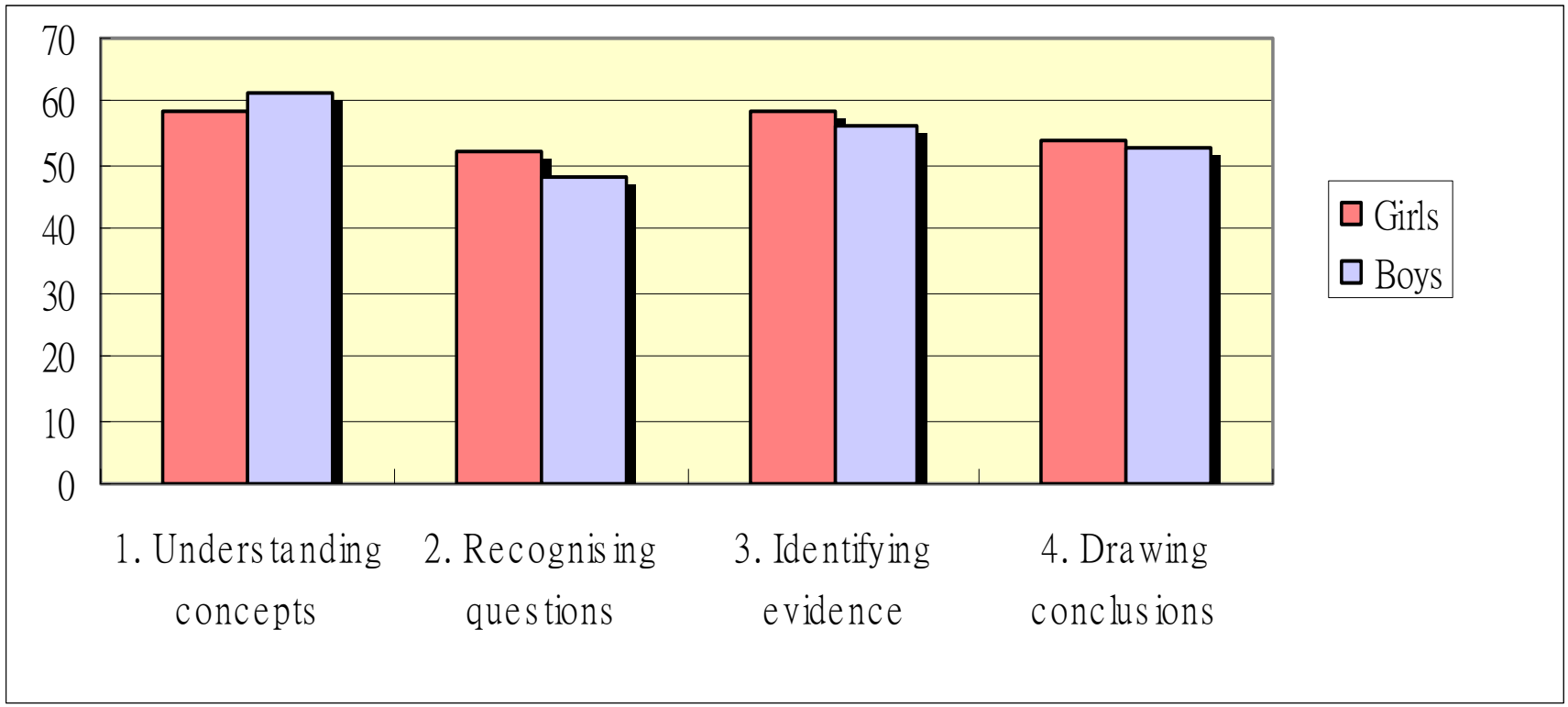
Comparison of scores of Hong Kong girls and boys in scientific literacy



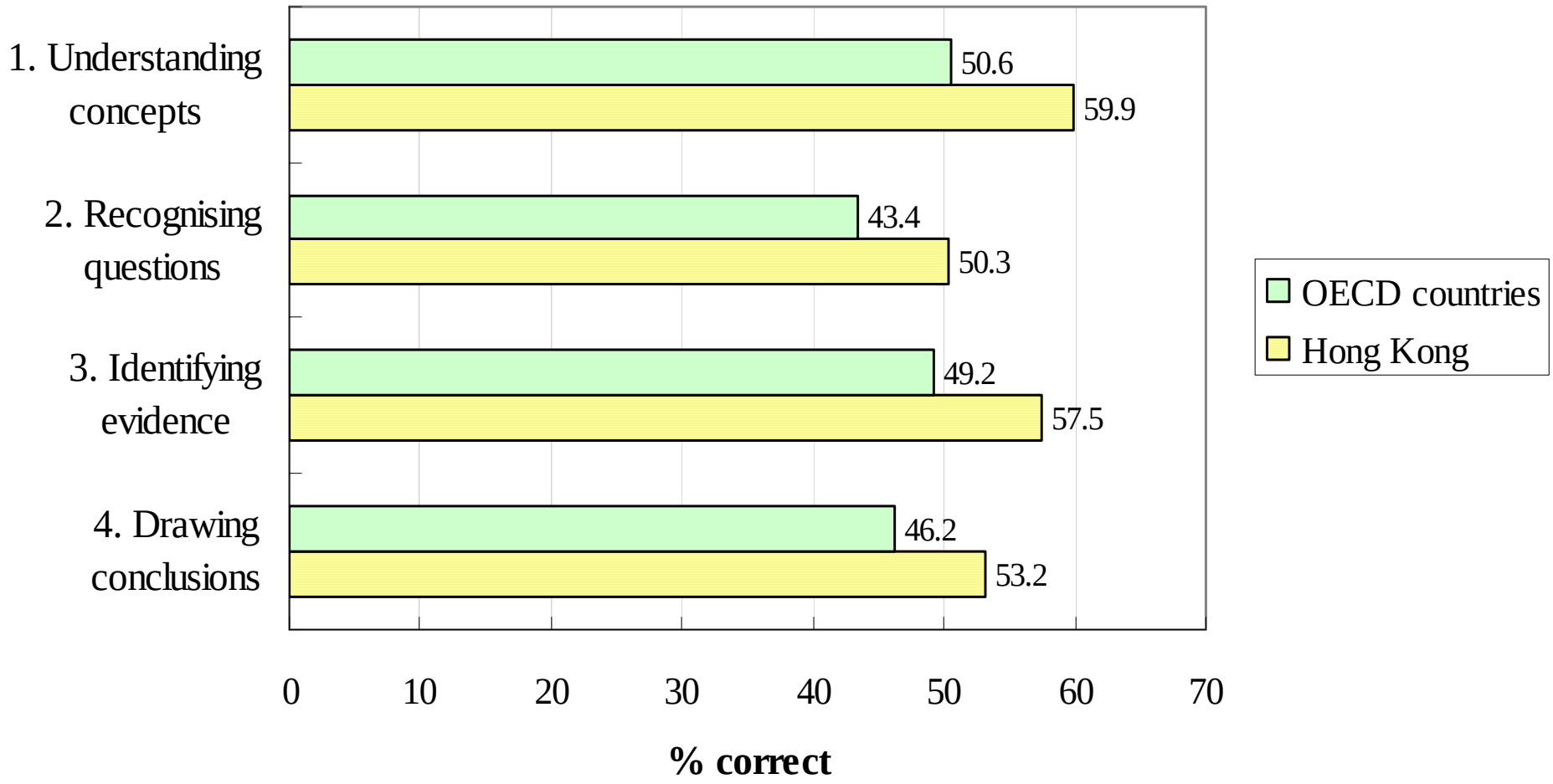
Gender difference in different components of scientific literacy

Ability	Gender	Mean score (%)
1. Understanding concepts	Girls	58.5
	Boys	61.4
2. Recognising questions	Girls	52.4
	Boys	48.1
3. Identifying evidence	Girls	58.7
	Boys	56.4
4. Drawing conclusions	Girls	54.0
	Boys	52.6
Processes of scientific inquiry [Abilities 2, 3 and 4]	Girls	56.2
	Boys	53.9

Gender difference in different components of scientific literacy



Performance in different components of scientific literacy



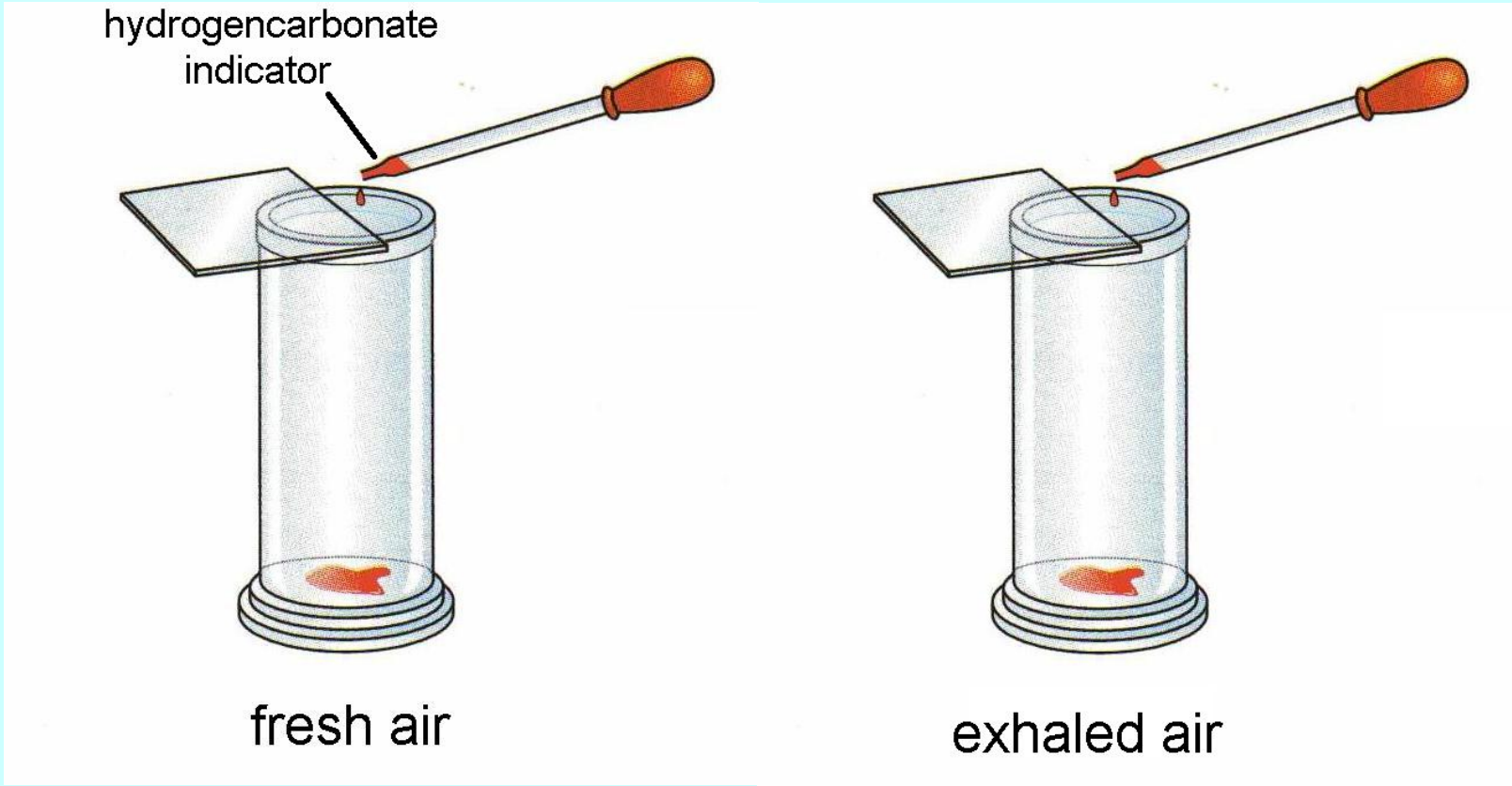
Strength of HK science education:

- Mastery of scientific knowledge
- Junior science encourages integration of practical work with learning of science concepts –

  investigatory approach
- Adequate supply of trained science teachers

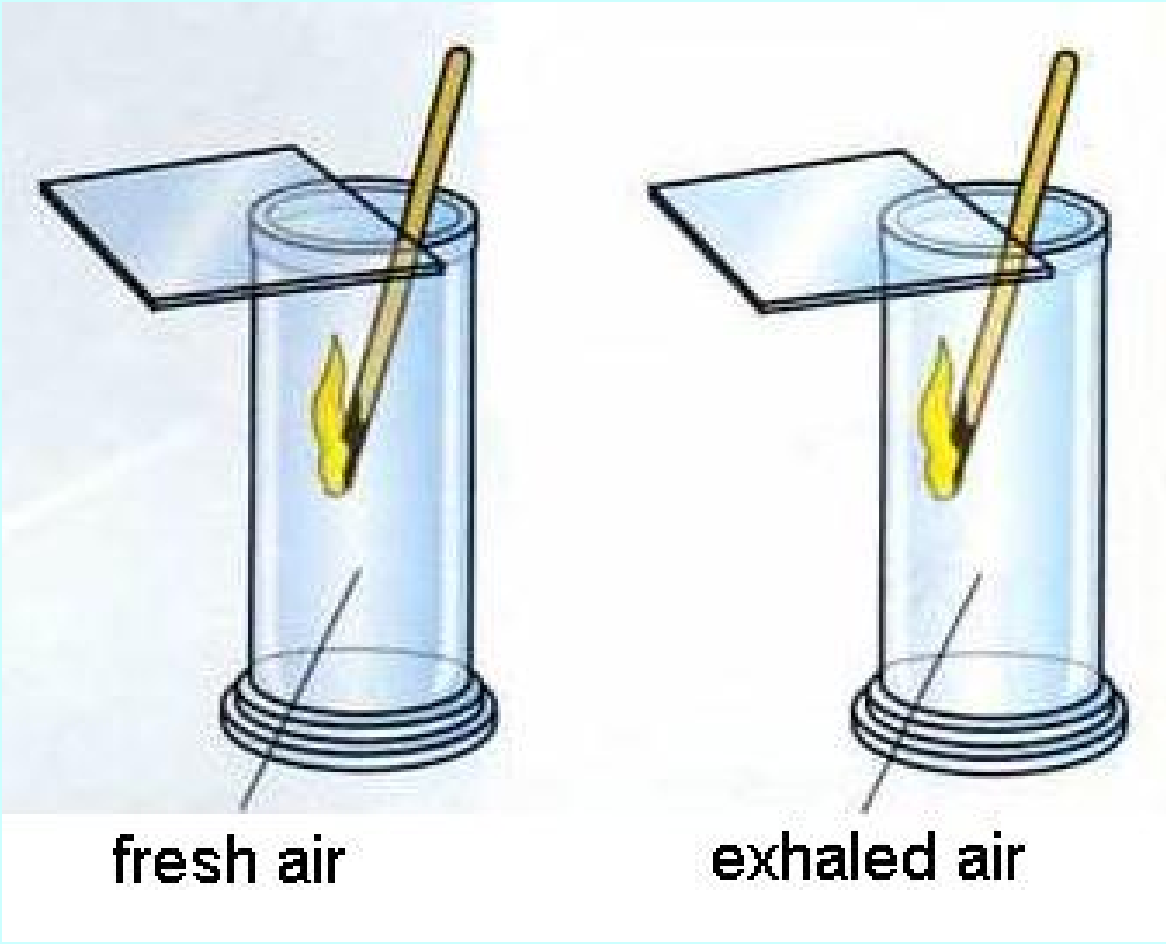
Problems of 'guided discovery' approach

- Prescriptive procedure
- Guided observation
- Guided conclusion.



What happens to the colour of the indicator?

Exhaled air contains _____ (less/more) carbon dioxide than fresh air.

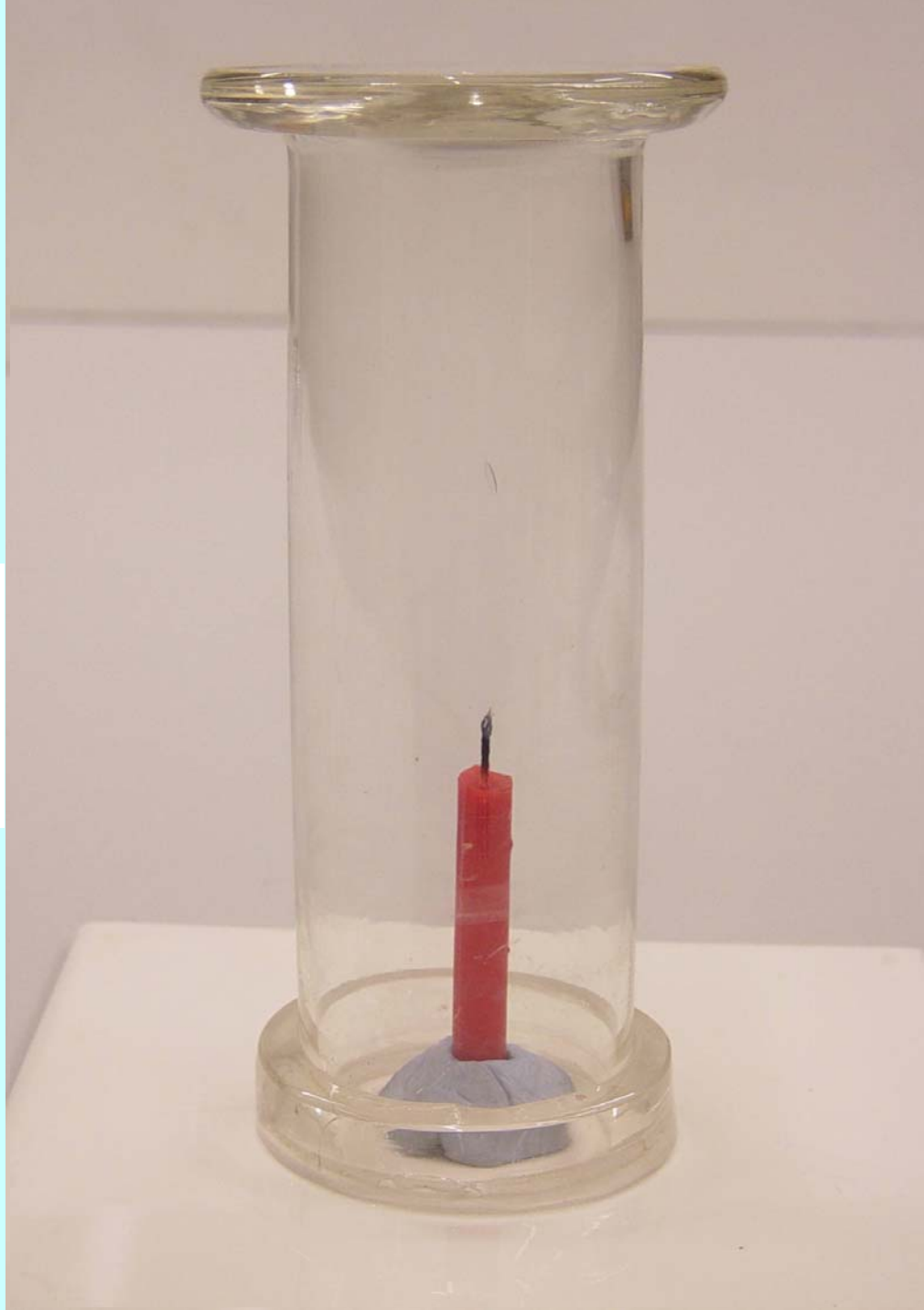


Which splint burns more brightly?

Exhaled air contains _____ (less/more) oxygen than fresh air.

Why does the flame go out ?

Because the burning candle has used up _____ in the air.



What can students learn ?

- manipulative skills
- observation
- drawing conclusions

but little opportunities to:

- identify problems for investigation
- formulate hypothesis
- design experiments

Deficient in understanding of the nature of scientific knowledge, the potentials & limitations of the scientific process

- important for solving everyday life problems, and to make informed decision on social and personal issues

Implications for the science curriculum?

If science education aims at promoting development of scientific literacy …

Science curriculum (S1-5) should include nature of science

⇩

Historical development of science concepts

(e.g. S & T curriculum)

Future PISA studies:

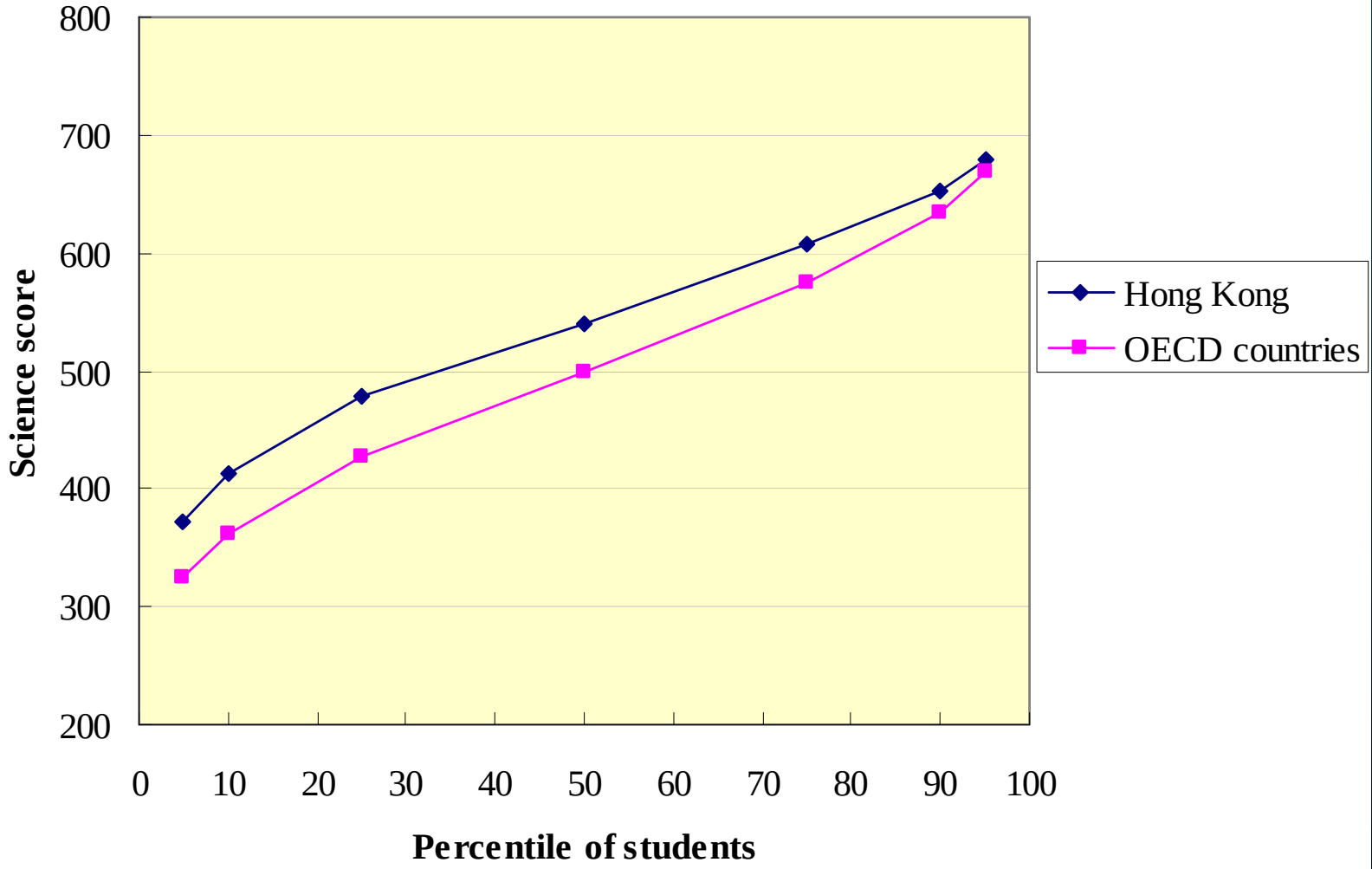
Tracking changes in literacy with time

⇩

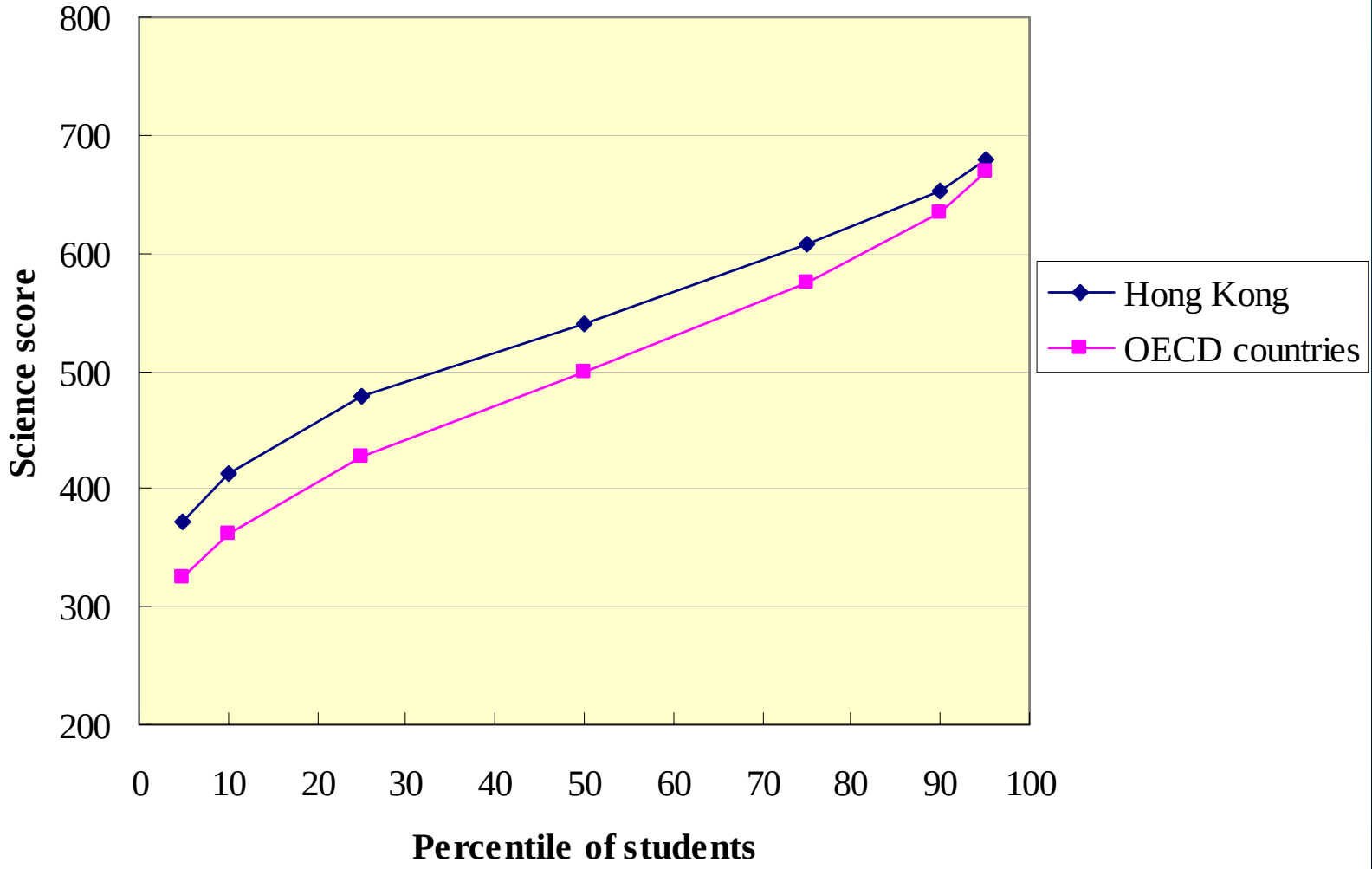
Impact of education reform on literacy

PISA 2006

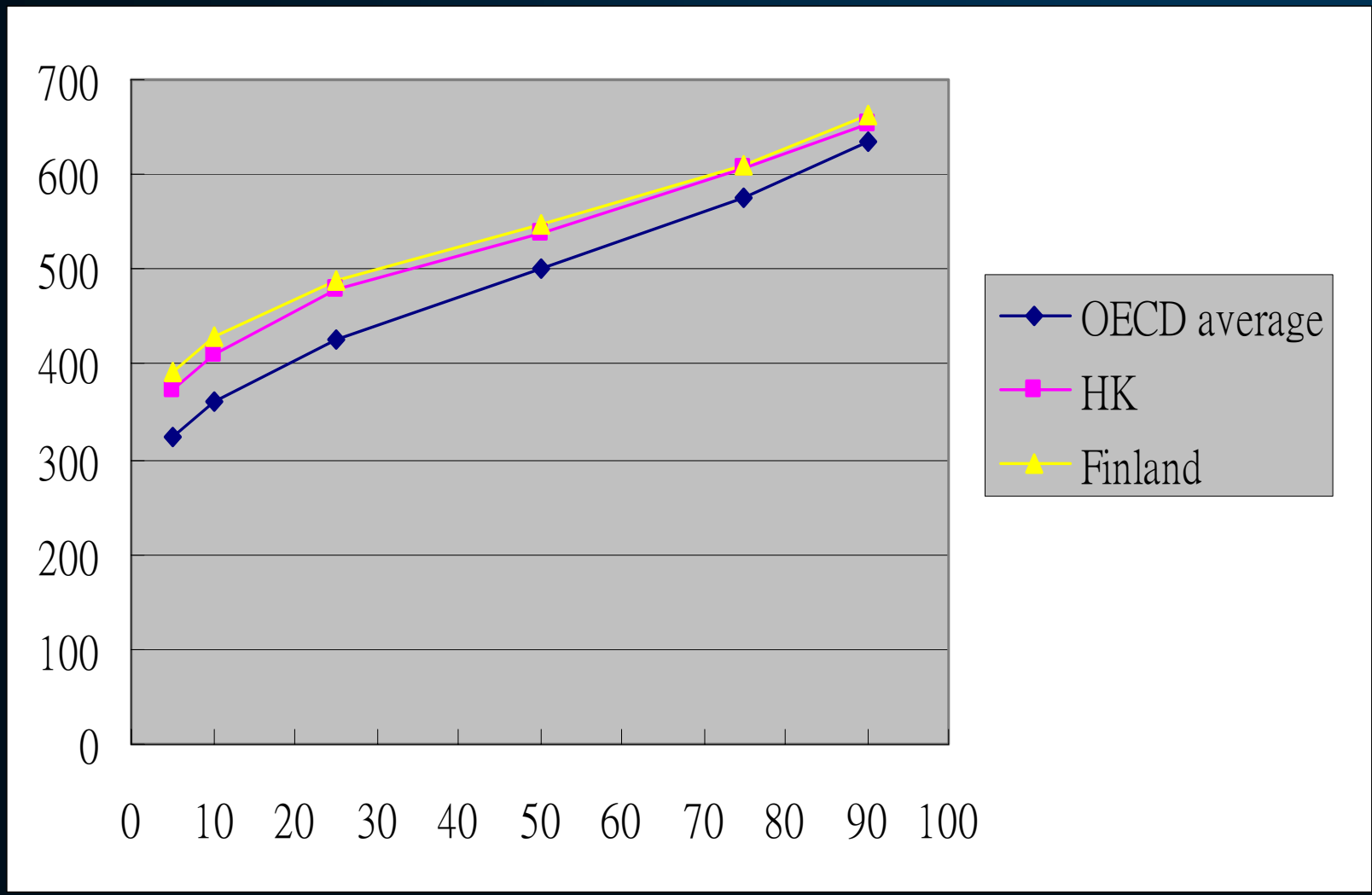
Student scores at different percentiles



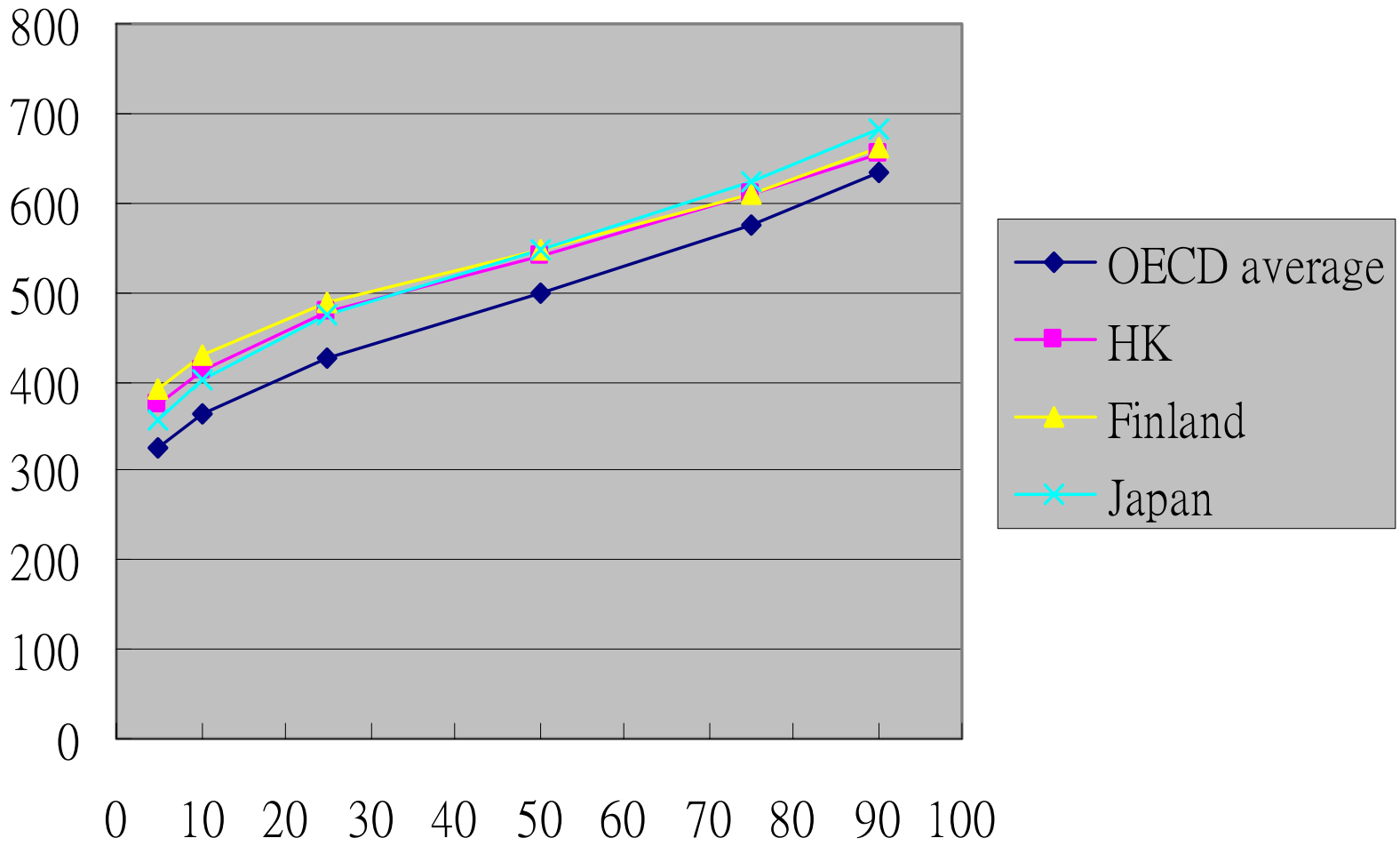
Student scores at different percentiles



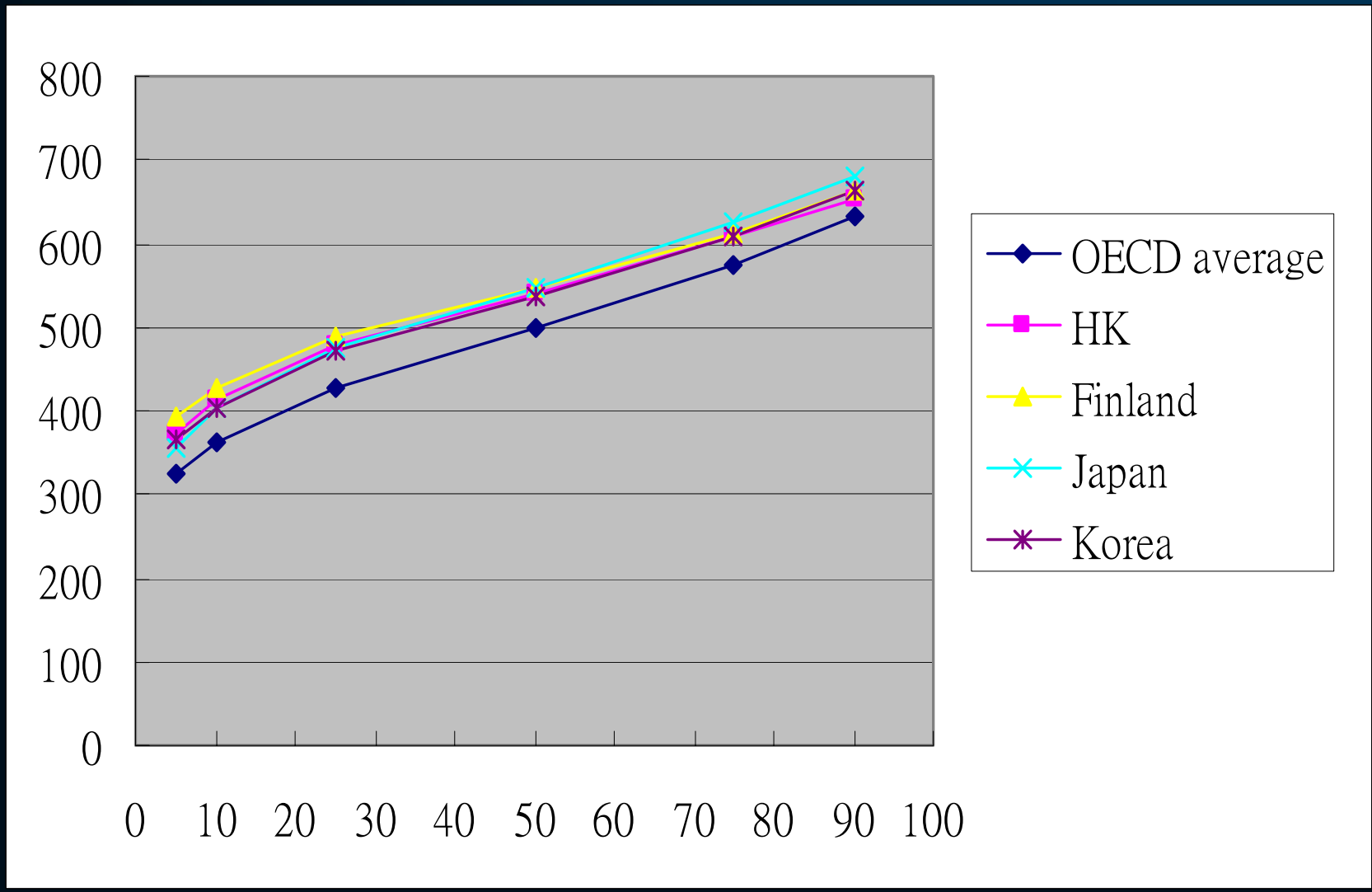
Student scores at different percentiles



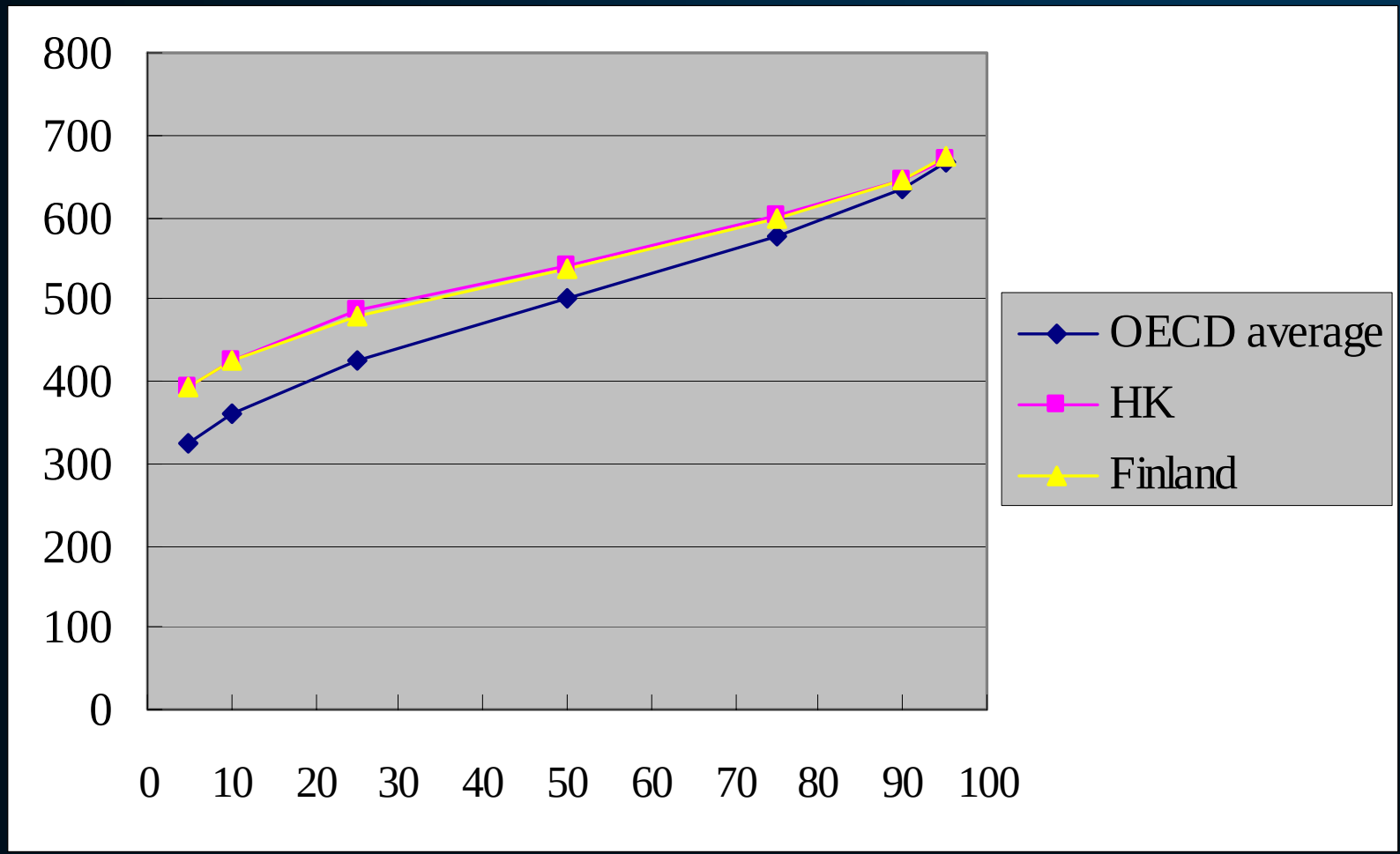
Student scores at different percentiles



Student scores at different percentiles



Student scores at different percentiles (PISA 2000)



Student scores in different grades