

A Tale of Two Classes – Language Issues in Teaching Civil Engineering

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**Department of Civil Engineering
The University of Hong Kong**

A List of Questions

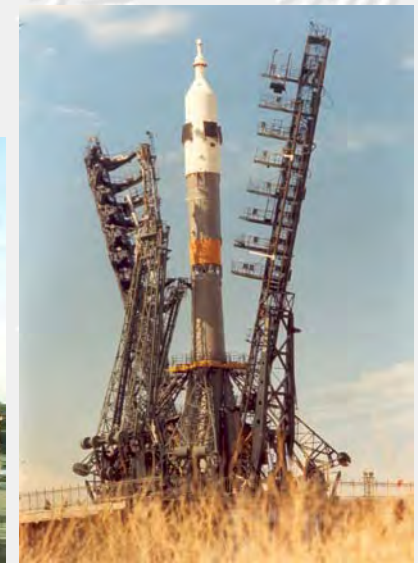
- What is Civil Engineering?
- What are the pre-requisites for the study?
- How to learn Civil Engineering?
- How is performance affected by
 - English language capability?
 - prior experience in learning using English as the medium of instruction?
- What are the lessons learnt?



What is Civil Engineering ?

The art of directing the great sources of power in nature for the use and convenience of man ...

The Institution of Civil Engineers, London, 1818



Transformation of Hong Kong from a Fishing Village to a Modern Society



Hong Kong in
19th century

Hong Kong in
21st century



Civil Engineering Projects in Hong Kong



High Island Reservoir



Mass Transit Railway



International Airport



Lantau Link

Disciplines in Civil Engineering

**Structural
Engineering**



**Geotechnical
Engineering**



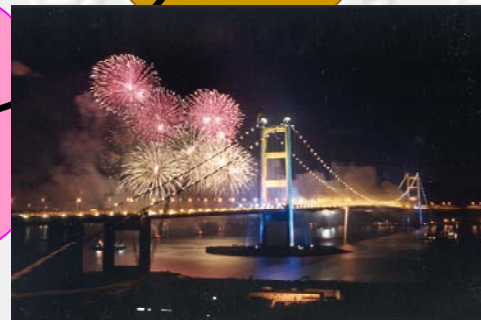
**Environmental
Engineering**



**Construction
Engineering &
Management**



**Transportation
Engineering**



Pre-requisites for Studying Civil Engineering

- Languages: English (and Chinese)

- Mathematics

- Physics

- Computer literacy / Information technology (IT)

- Chemistry (to certain extent)



Types of Courses in Civil Engineering

Mathematics / Science

Mathematics;
Structural mechanics;
Fluid mechanics

Theory & Design
of Structures I

Language

Language
courses

Construction project
management



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Programme Structure

Mainstream

“1+3 mode”

“2+2 mode”

Secondary 7

Year 0
(PRC universities)

Year 0
(Sun Yat-Sen U)

Theory & Design of Structures I

T & D of
Structures I

Year 2

Year 2

Year 2

Year 3

Year 3

Year 3



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Media of Instruction

Mainstream

“1+3 mode”

“2+2 mode”

PRC U's: Chinese except for English language courses

Year 0
(PRC universities)

Year 0
(Sun Yat-Sen U)

Year 1

Year 1

Year 1
(Sun Yat-Sen U)

HKU: English except for Chinese language courses
Year 2

Year 2

Year 2

Year 3

Year 3

Year 3

SYSU: half Chinese and half English

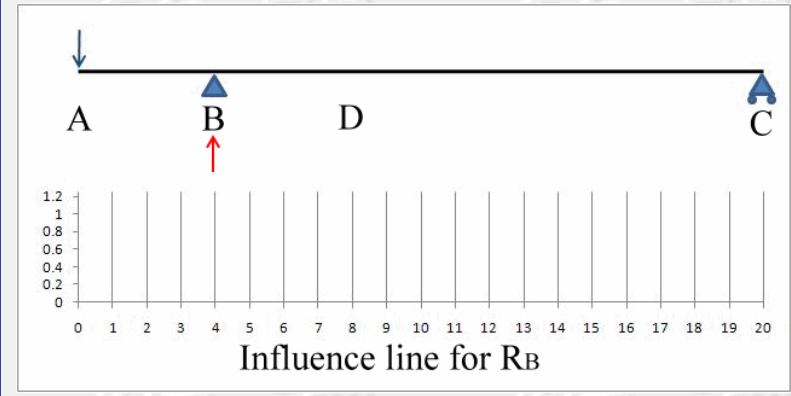


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Topics in Theory & Design of Structures I

Mathematics / Science

Theory of structures



Moment-area Method

The tangents at P and Q to the elastic line cut off an intercept z on Oy.

$$\frac{d^2y}{dx^2} = -M / EI$$

Integrating between P and Q,

$$\left[\frac{dy}{dx} \right]_P^Q = - \int \frac{M dx}{EI}$$

If EI is constant, $\theta = \left(\frac{dy}{dx} \right)_P - \left(\frac{dy}{dx} \right)_Q = \frac{A}{EI}$

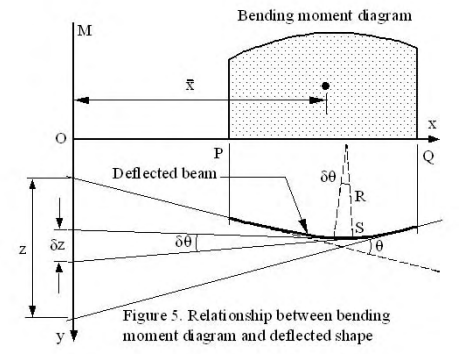


Figure 5. Relationship between bending moment diagram and deflected shape

Language



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Topics in Theory & Design of Structures I

Mathematics / Science

Design of structural elements

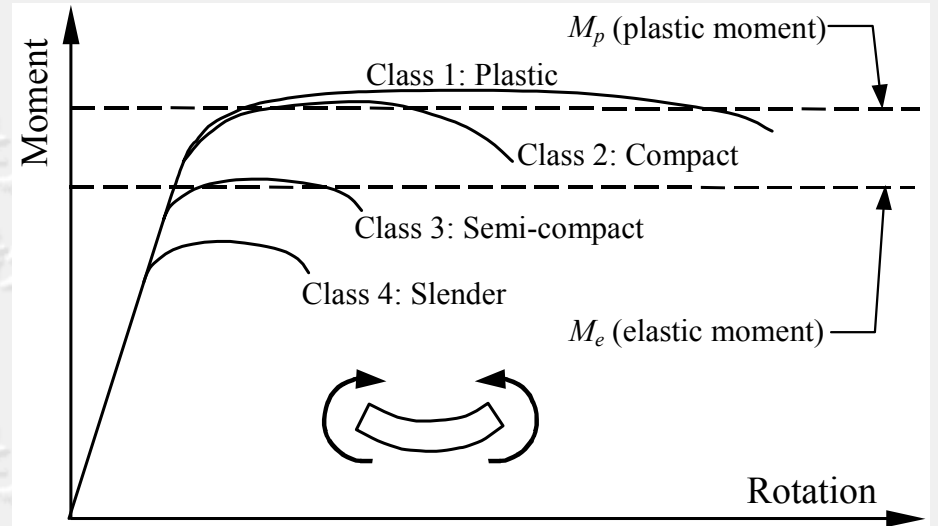
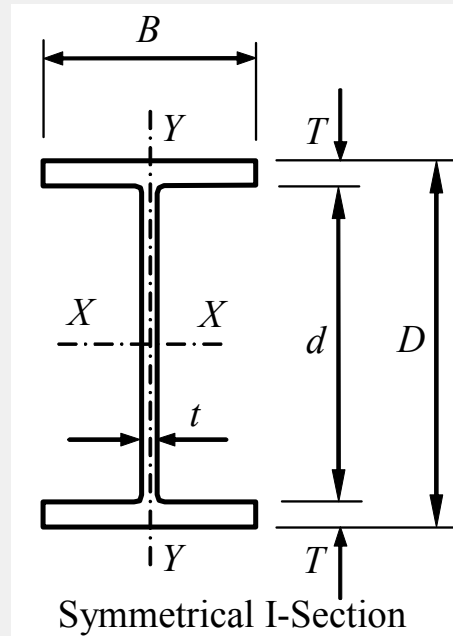


Figure 7. Typical moment-rotation characteristics of different classes of sections

Language



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Topics in Theory & Design of Structures I

Mathematics / Science

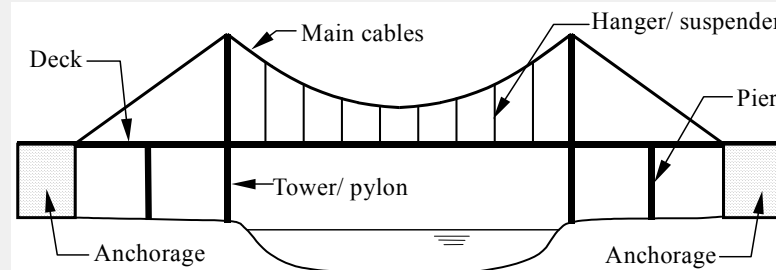


Figure 3. A typical suspension bridge.

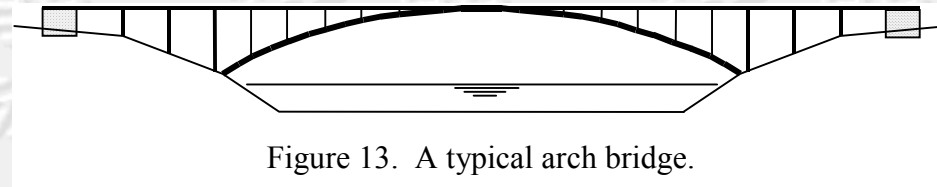


Figure 13. A typical arch bridge.

Language

Structural design;
structural forms

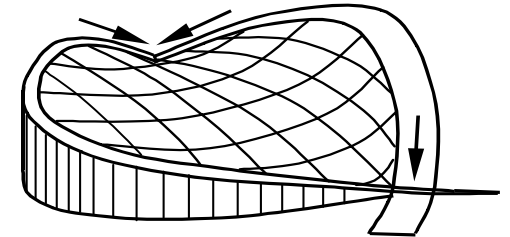


Figure 7. Suspension roof with parallel suspension cables, supported by crossed arches.



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Coursework in Theory & Design of Structures I

Mathematics / Science

Structural analysis

Concentrated load P at mid-span

$$A = (1/2) (PL/4) (L/2) = PL^2/16$$

$$\text{Slope at support} = A/EI = PL^2/16EI$$

Deflection at mid-span

= deflection of support relative to centre

$$= A\bar{x}/EI$$

$$= (PL^2/16) (L/3) / EI$$

$$= PL^3/48EI$$

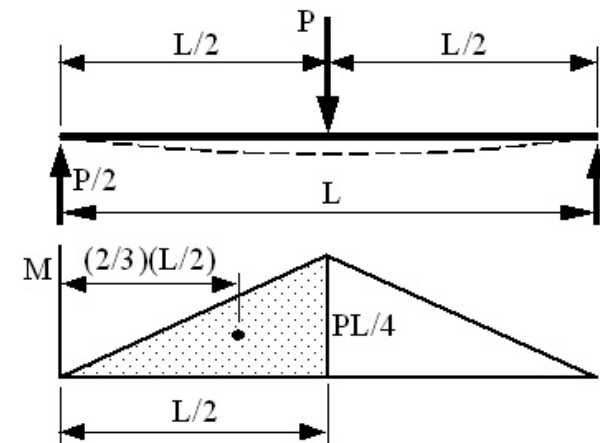


Figure 7. A simply supported beam under a central point load

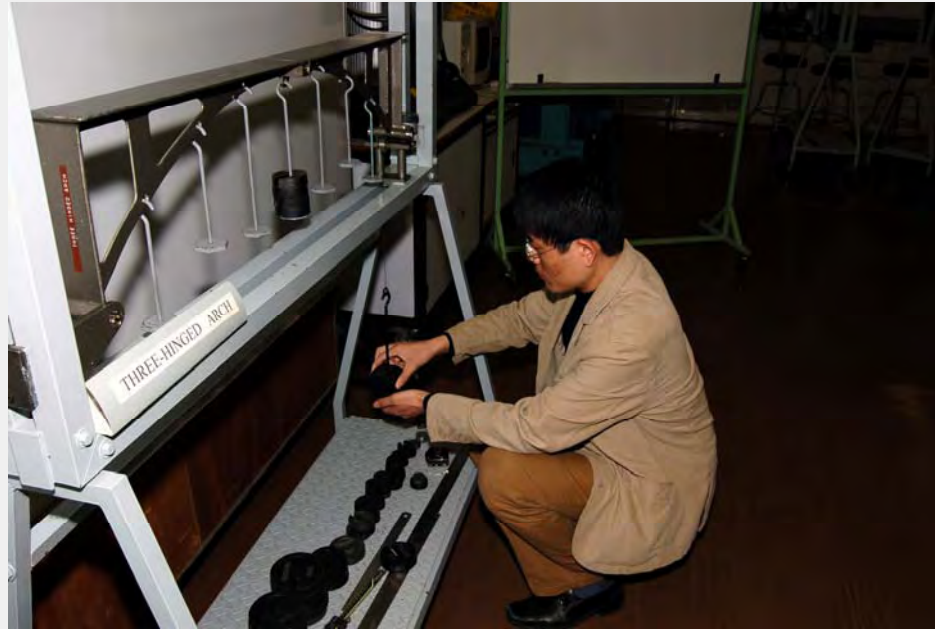
Language



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Coursework in Theory & Design of Structures I

Mathematics / Science



Language

Laboratory
report



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Coursework in Theory & Design of Structures I

Mathematics / Science



Report on an existing structure

Essay

Language



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Data Collected from the Two Classes

- Questionnaires

- background

- civil engineering education

- teaching methods

- Results from test and examination

- individual questions and overall

- Interviews with students



The Questionnaire

LANGUAGE ISSUES IN CIVIL ENGINEERING EDUCATION

HKU/2007

This small scale research survey is being carried out to address various language issues in civil engineering education. Unless otherwise stated, the course refers to "Theory and Design of Structures I". All responses will remain anonymous. Thank you for your co-operation!

Please respond by putting a tick (✓) in the suitable box.

Your background

Your background

	Top 10%	Next 20%	Next 40%	Next 20%	Bottom 10%
1. How do you rate yourself among students in your region in each of the following areas?					
(a) English	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Chinese (if applicable)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Mathematics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) Computer literacy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e) Physics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. What is your first language?					
	Chinese (Putonghua)	Chinese (Cantonese)	English	Others	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. How long have you had formal English language education before the year 2006-07?		Up to 2 years	3 – 5 years	Above 5 years	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. How long have you had formal English-medium teaching in subjects other than English language before the year 2006-07?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Civil engineering education

Civil engineering education

	Excellent	Very good	Good	Fair
5. How would you rate yourself in coping with English-medium study of civil engineering?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. How important is English language capability to the study of each of the following areas?	Most important	Very important	Important	Not important
(a) Theory of structures – conceptual topics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Theory of structures – analytical topics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Design of structures – conceptual topics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) Design of structures – design calculations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. How important is English language capability to each of the following in this course?	Most important	Very important	Important	Not important
(a) Tutorial assignments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Experiments and reports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Essay on an existing structure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) Test and examination	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Most important	Very important	Important	Not important
8. How important is capability in each of the following to the study of civil engineering?				
(a) Language(s): English / Chinese	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Mathematics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Computer literacy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) Physics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Teaching methods

Teaching methods

	Most useful	Very useful	Useful	Not useful
9. How do you rate the usefulness of the following components of this course?				
(a) Lectures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Tutorial assignments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Experiments and reports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) Essay on an existing structure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e) Test and examination	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. How do you rate the following methods of teaching in general?	Most useful	Very useful	Useful	Not useful
(a) Lecturing using blackboard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Lecturing using transparency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Lecturing using Powerpoint presentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) WebCT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Miscellaneous

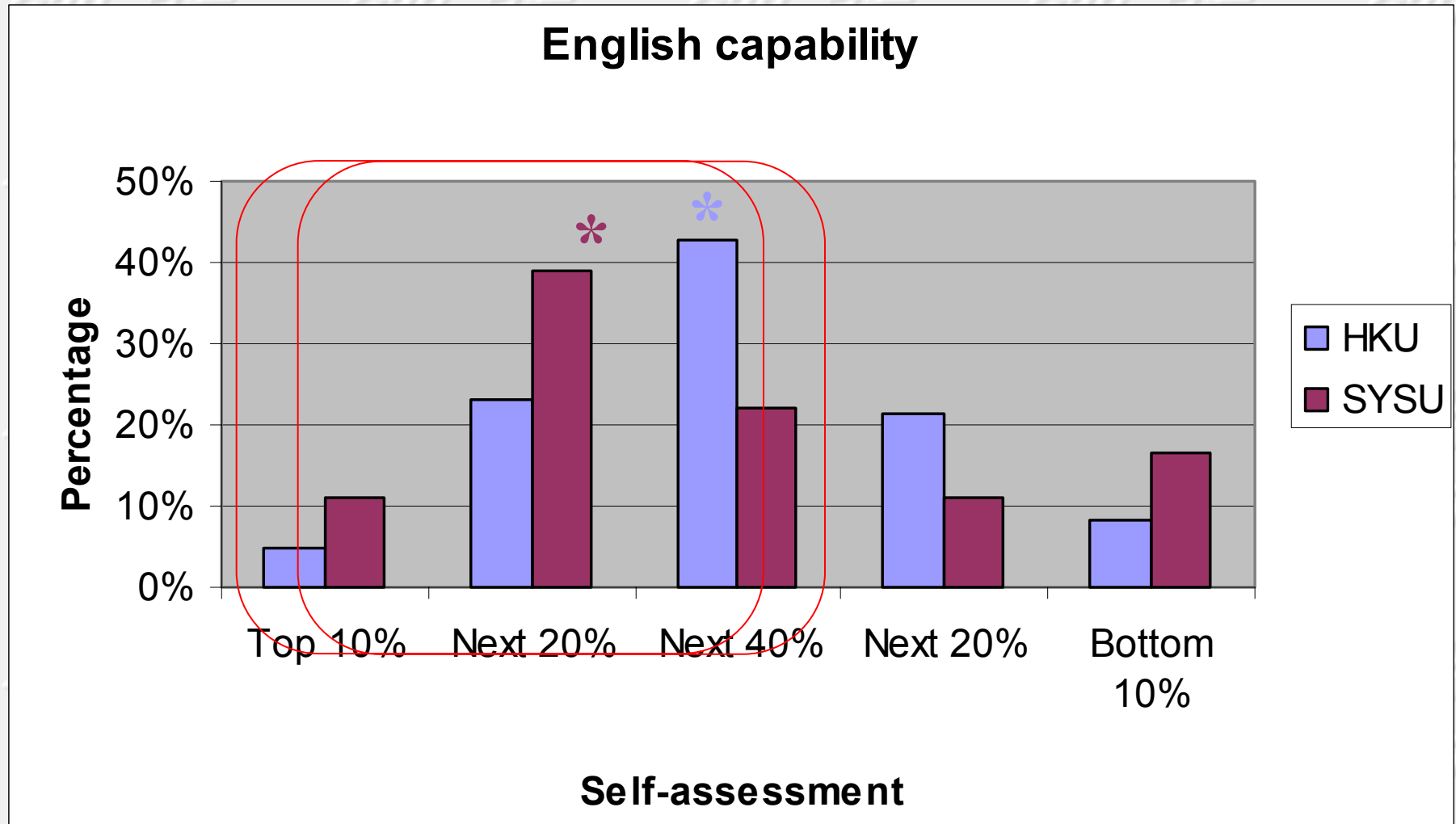
Miscellaneous

	Excellent	Very good	Good	Fair
11. How would you rate yourself in civil engineering practice				
(a) in an English-speaking environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) in a Chinese-speaking environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) in a mixed language (Chinese-English) environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Specifically for this course, how many books have you	0	1	2	3 or more
(a) bought?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) borrowed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. How useful is each of the following materials to the study of this course?	Most useful	Very useful	Useful	Not useful
(a) Books	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Notes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) WebCT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. How useful is this course in enhancing your capability in the use of English?	Most useful	Very useful	Useful	Not useful
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

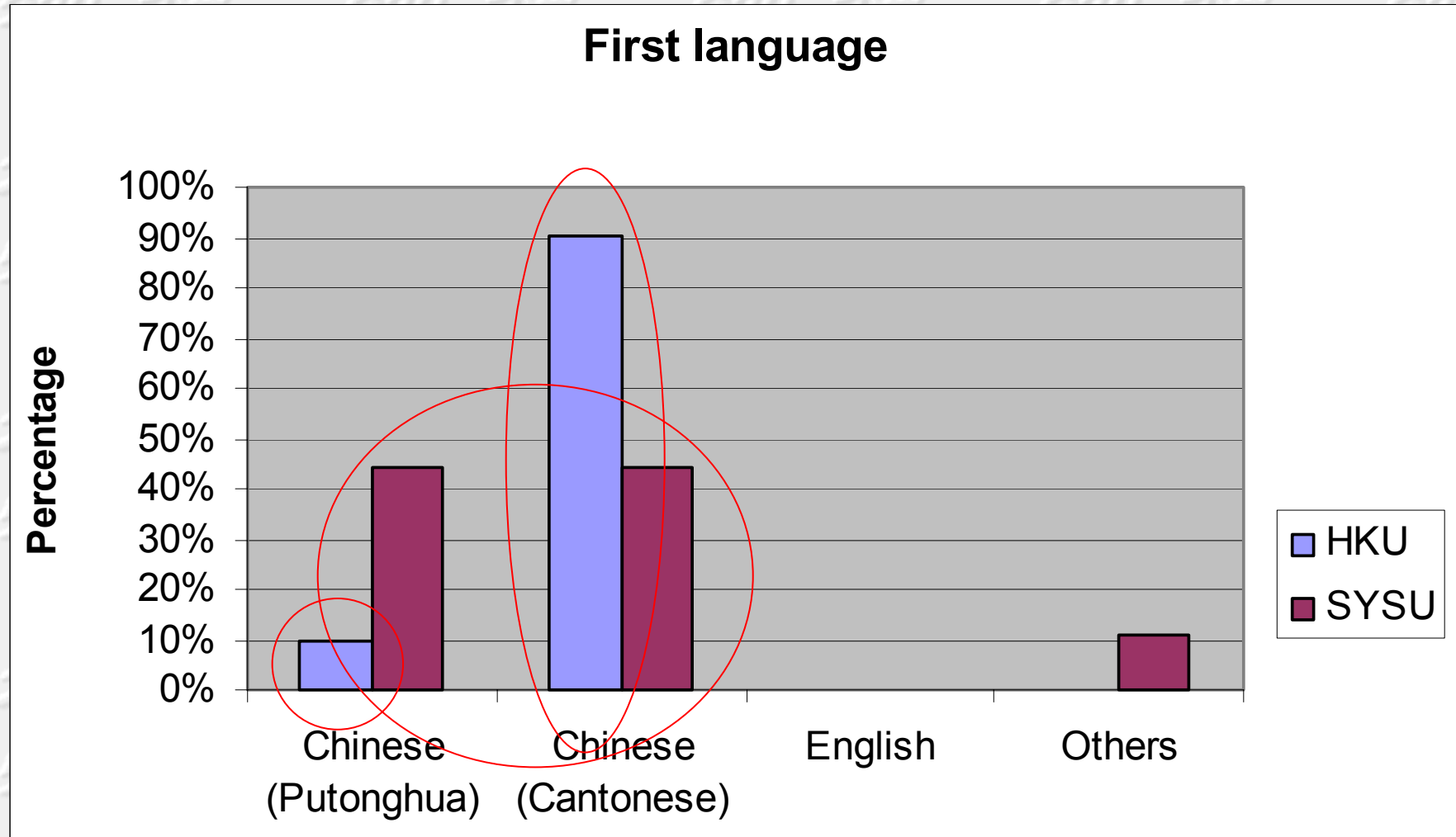
Thank you again for your help!

Francis T.K. Au (Dr.)
April 2007

Background of the two classes

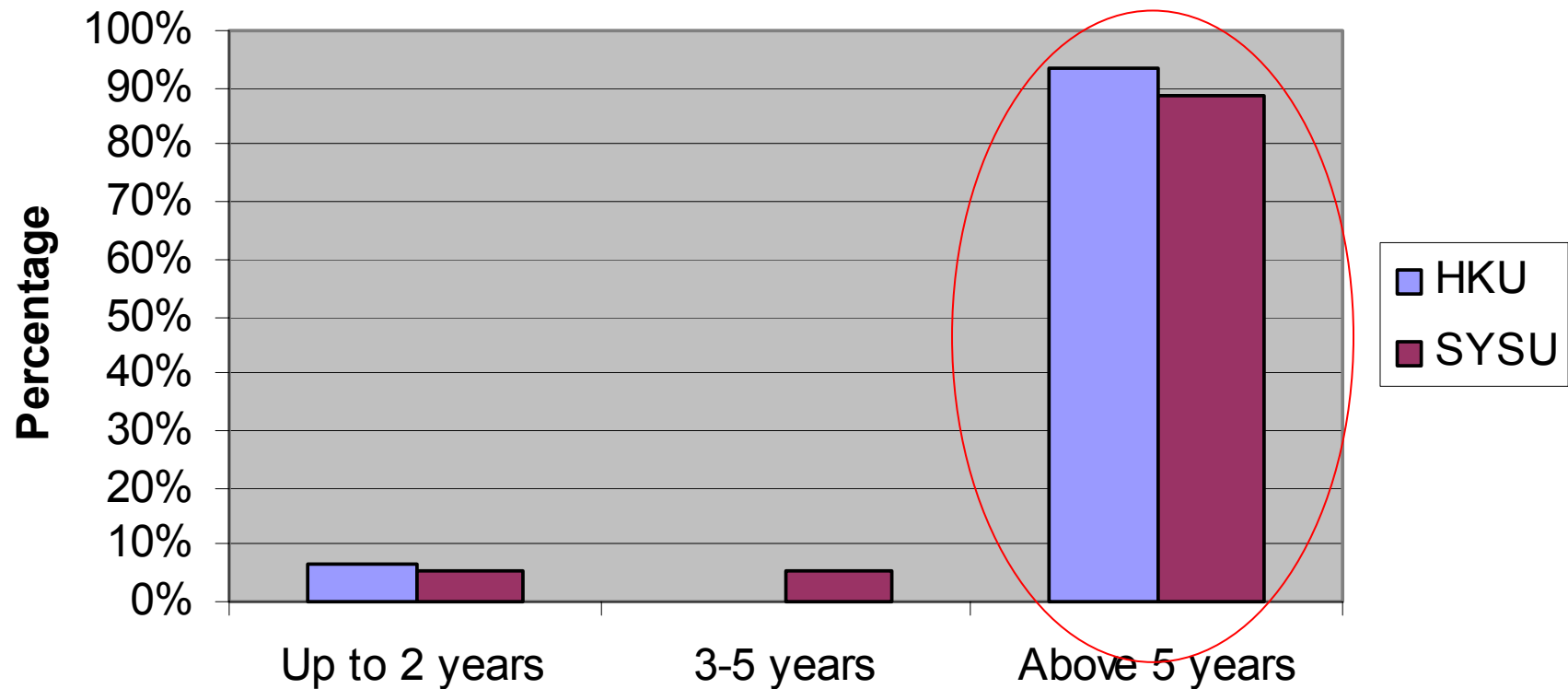


Background of the two classes



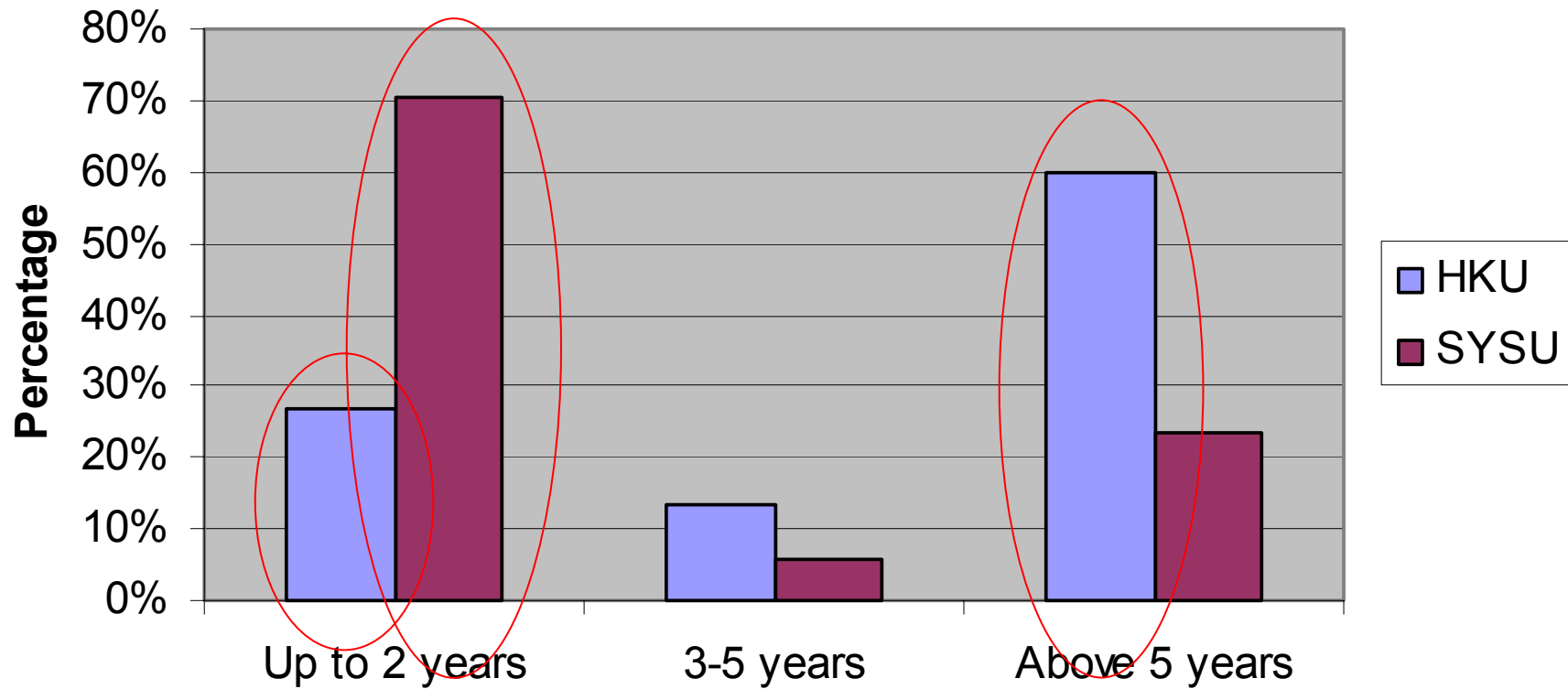
Background of the two classes

Formal English language education



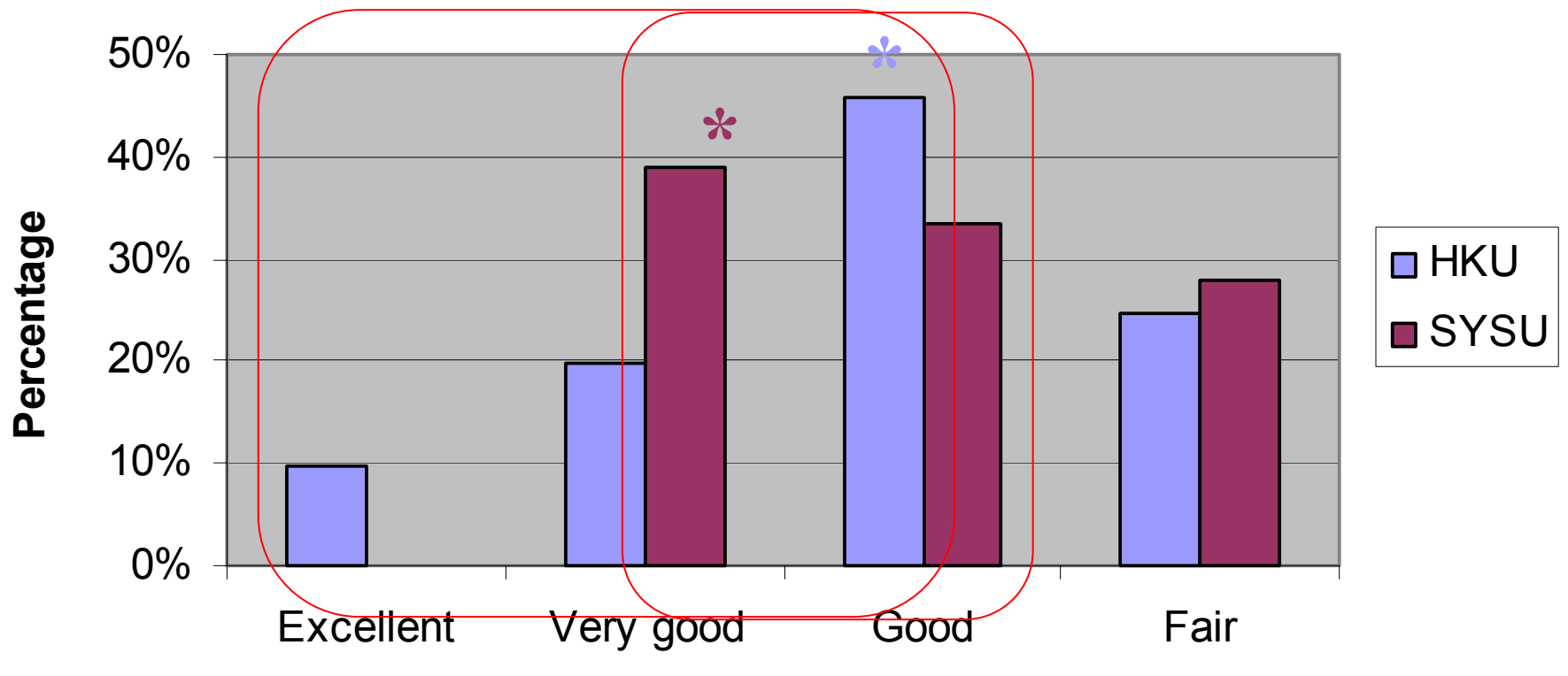
Background of the two classes

Experience with English-medium teaching



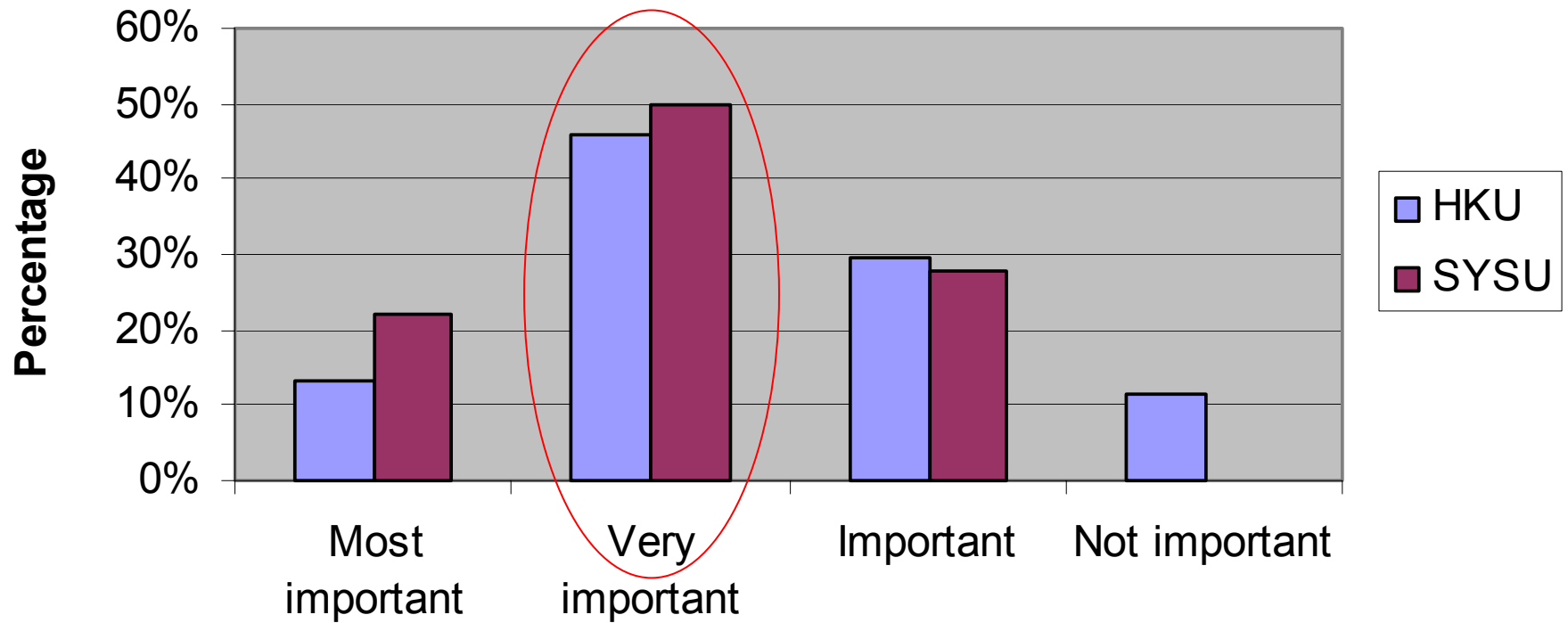
Civil engineering education

Self-assessment of capability in English-medium study of civil engineering



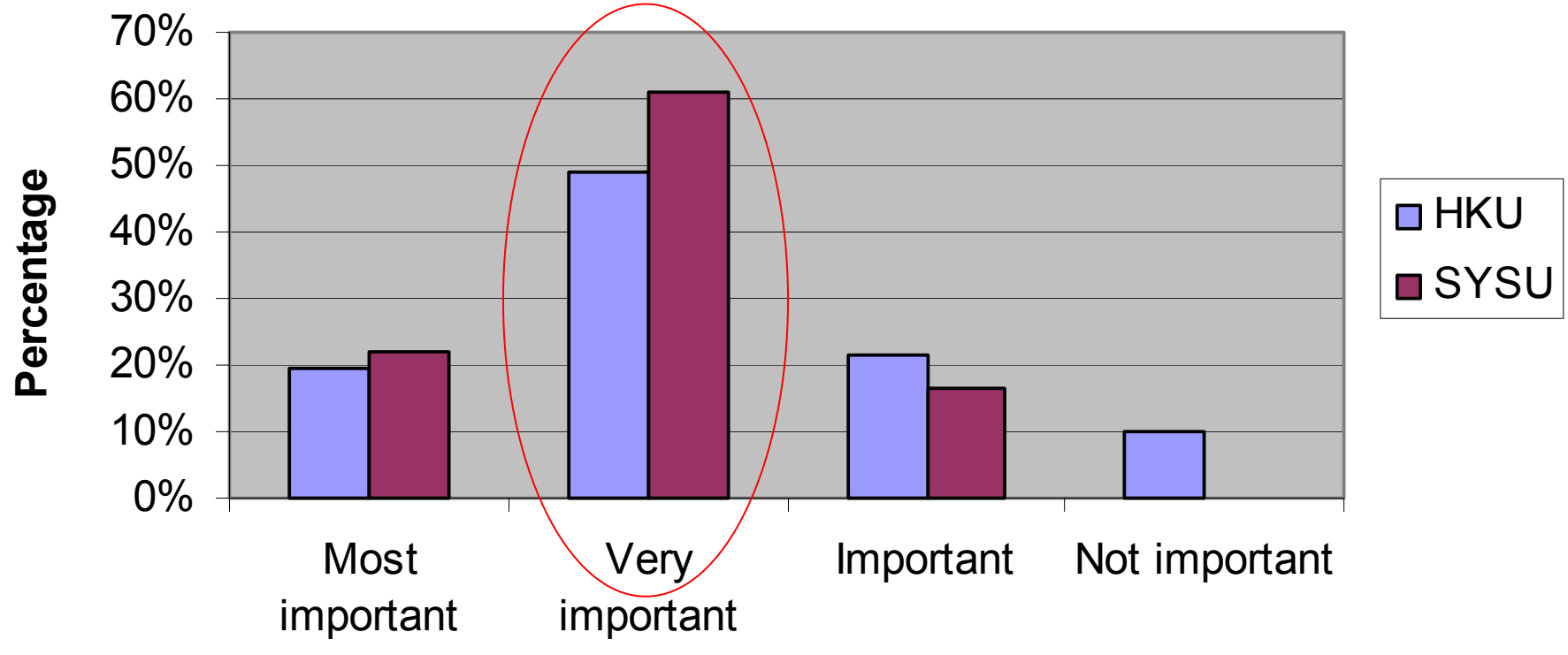
Civil engineering education - topics

**Importance of English language capability:
Theory of structures - conceptual topics**



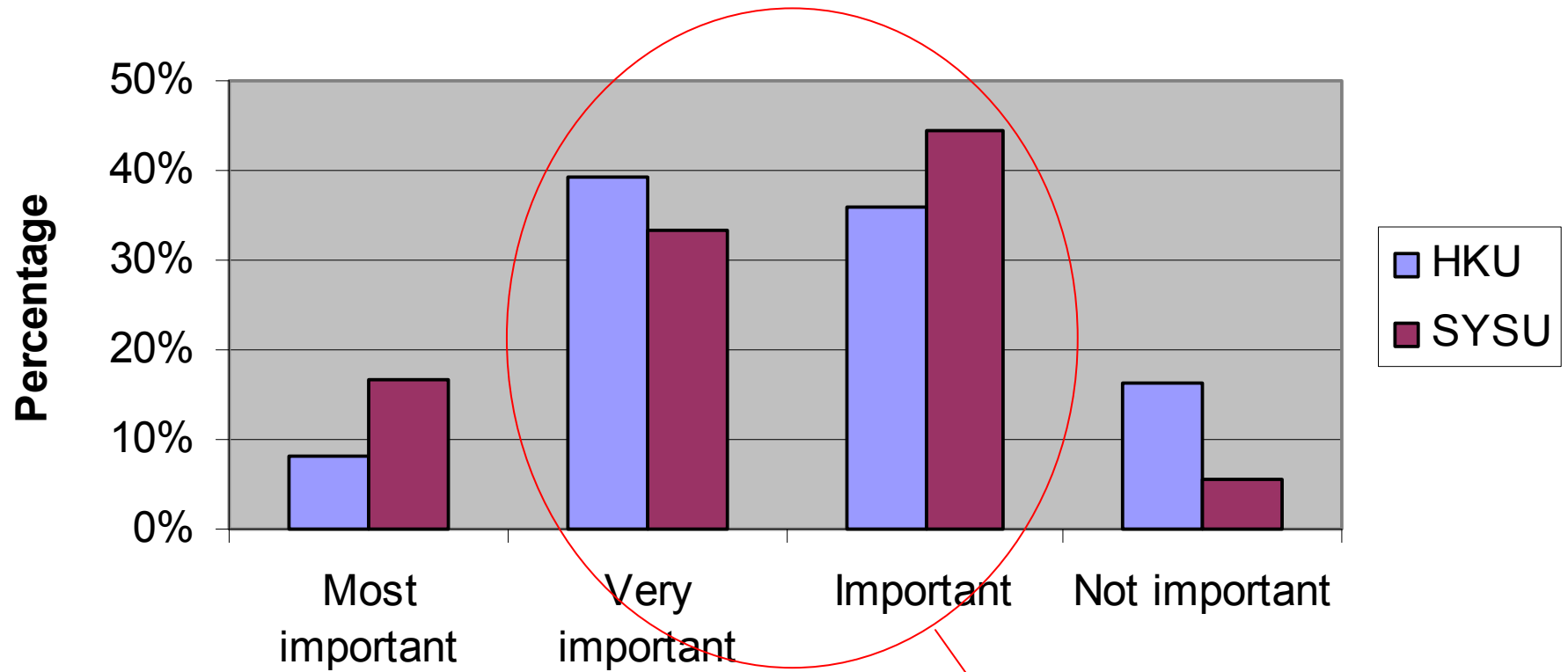
Civil engineering education - topics

Importance of English language capability: Design of structures - conceptual topics



Civil engineering education - topics

**Importance of English language capability:
Theory of structures - analytical topics**

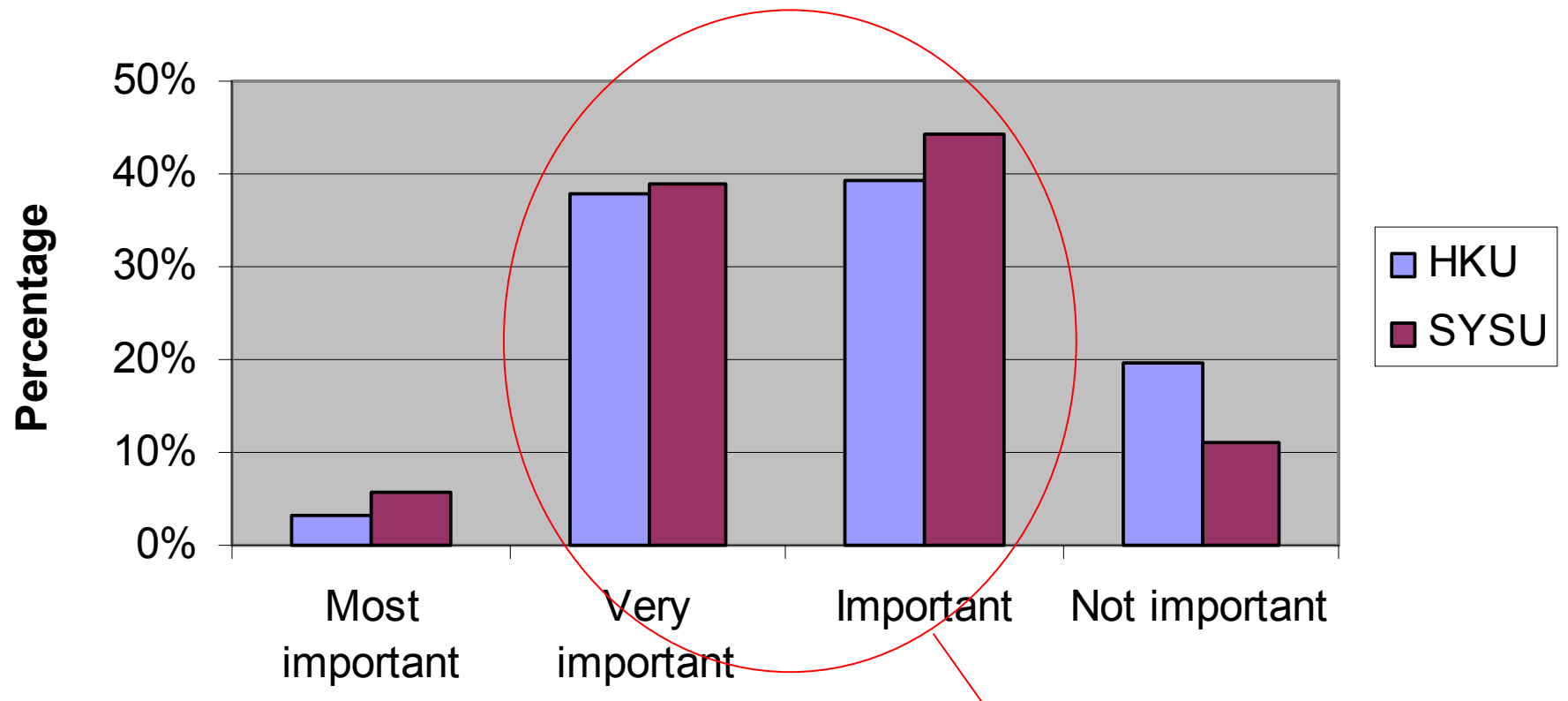


Use of much more mathematics



Civil engineering education - topics

Importance of English language capability: Design of structures - design calculations

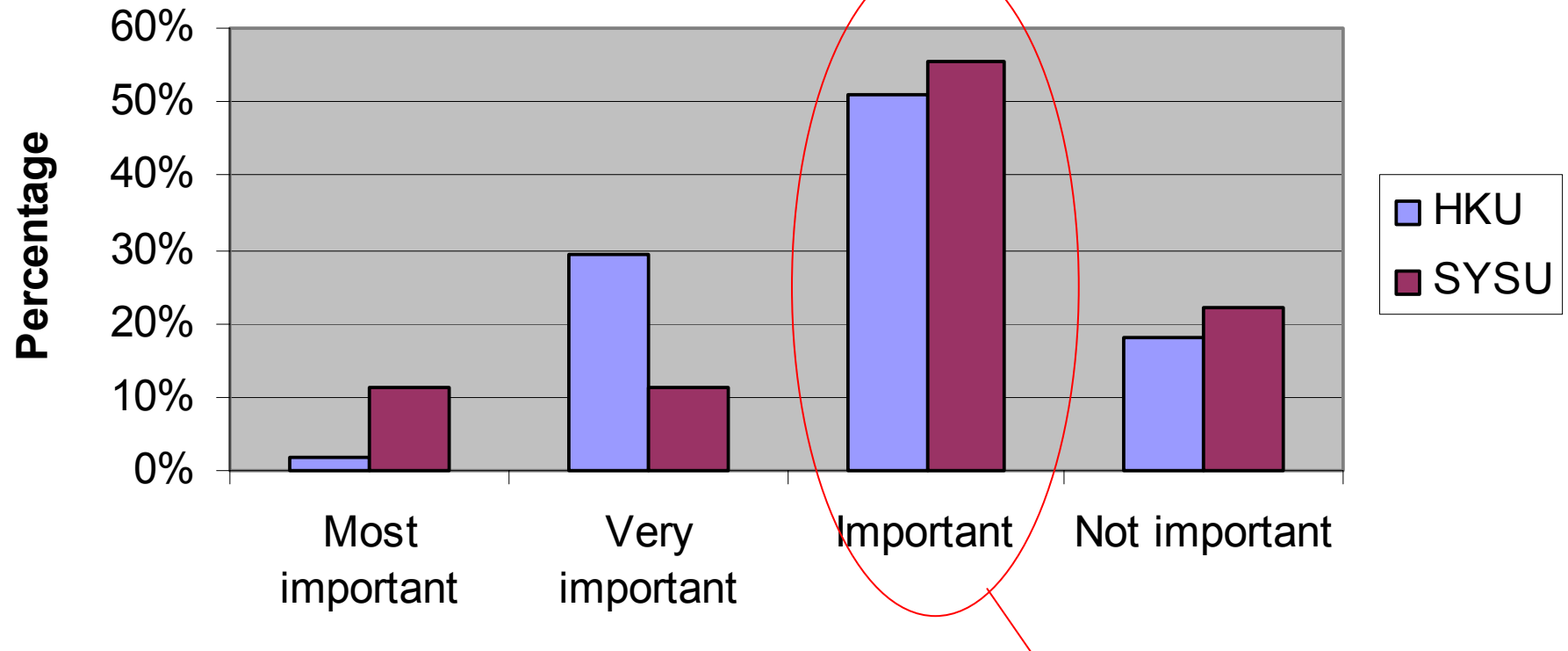


Use of much more
mathematics



Civil engineering education - coursework

**Importance of English language capability:
Tutorial assignments**

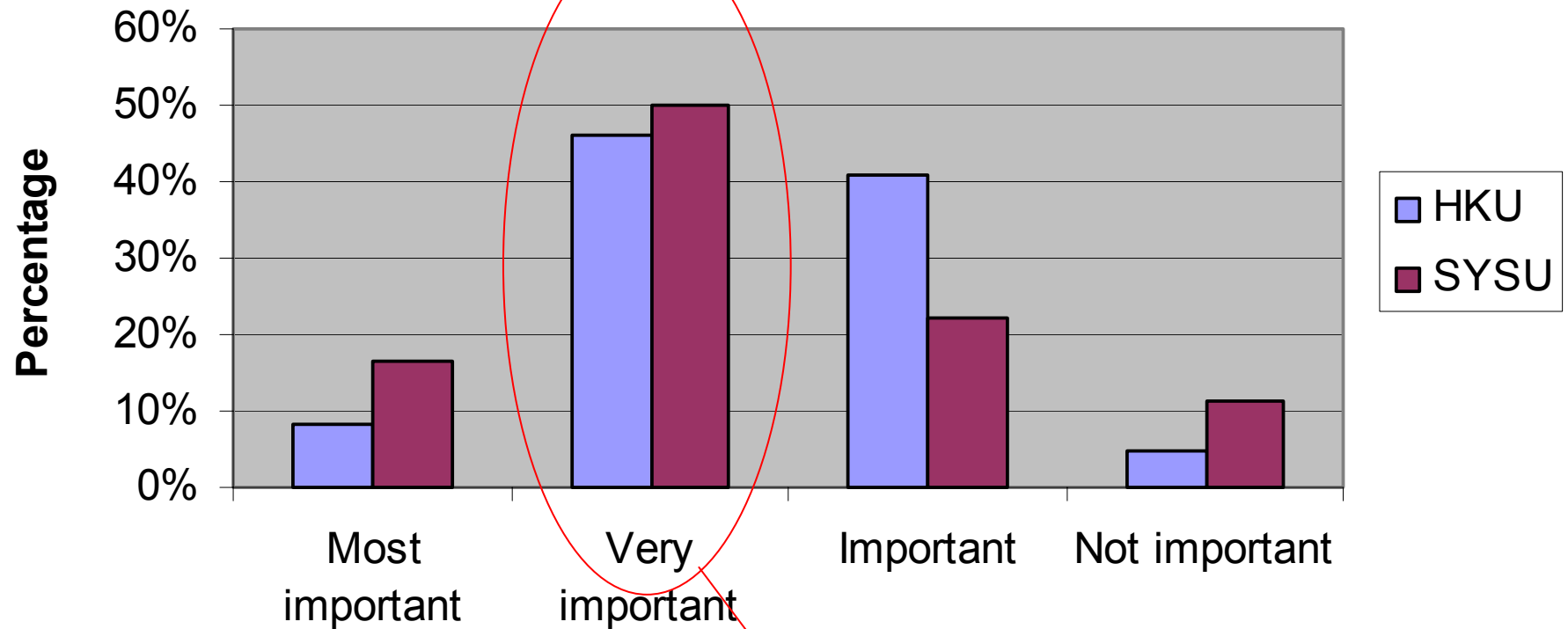


Much use of
engineering theory



Civil engineering education - coursework

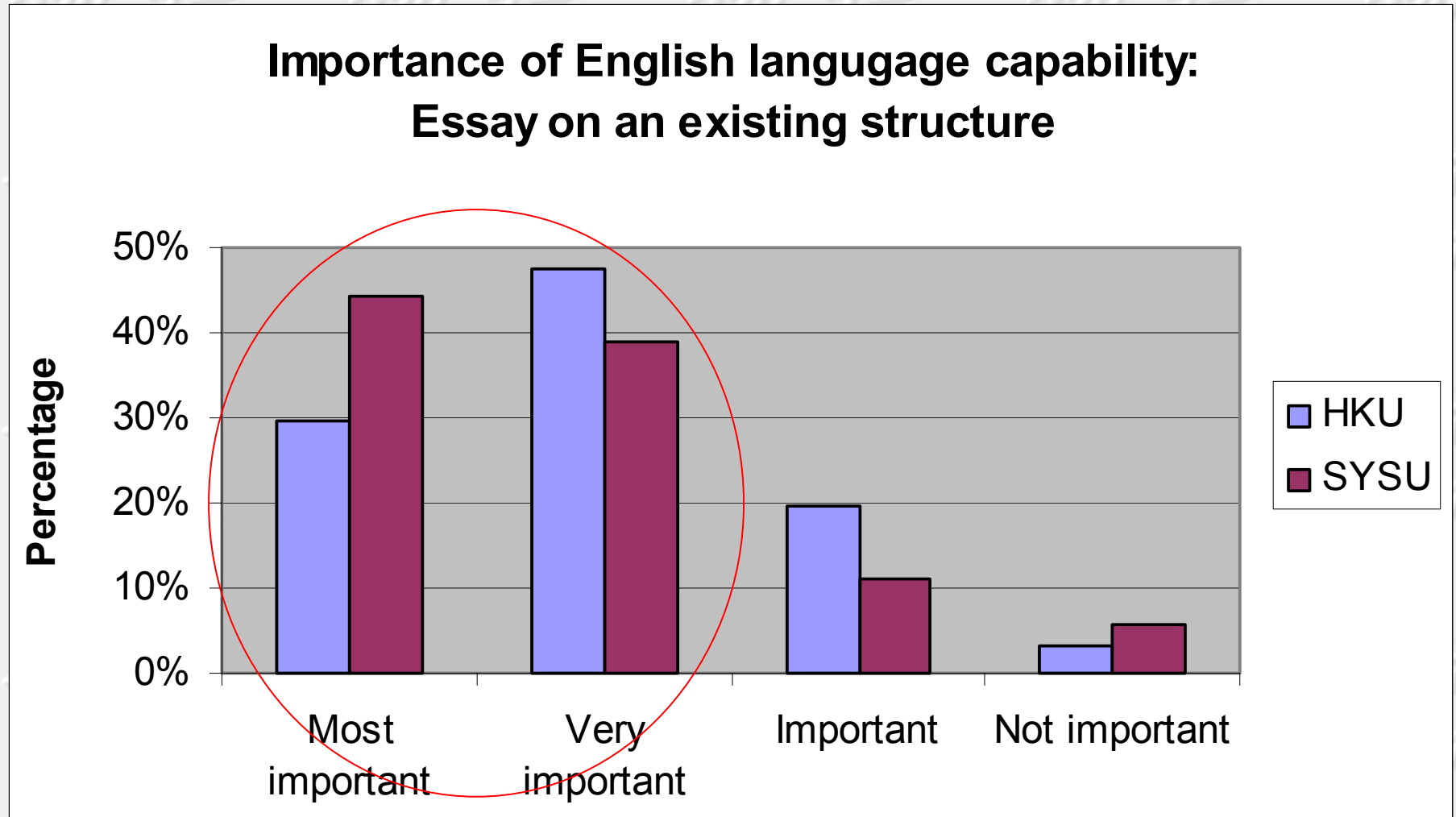
**Importance of English language capability:
Experiments and reports**



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Importance of both language
and engineering theory

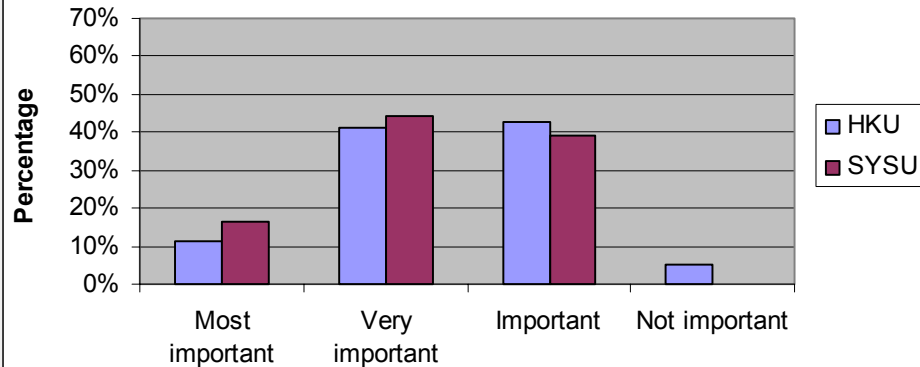
Civil engineering education - coursework



Importance of various pre-requisites

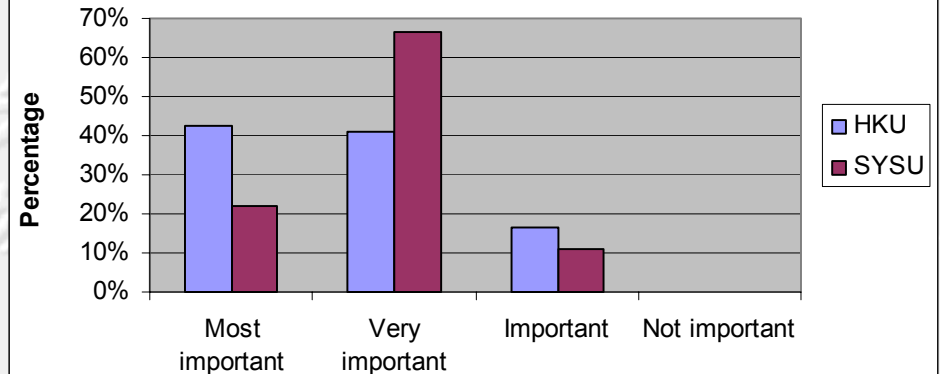
Importance to study of civil engineering:

Language(s): English / Chinese



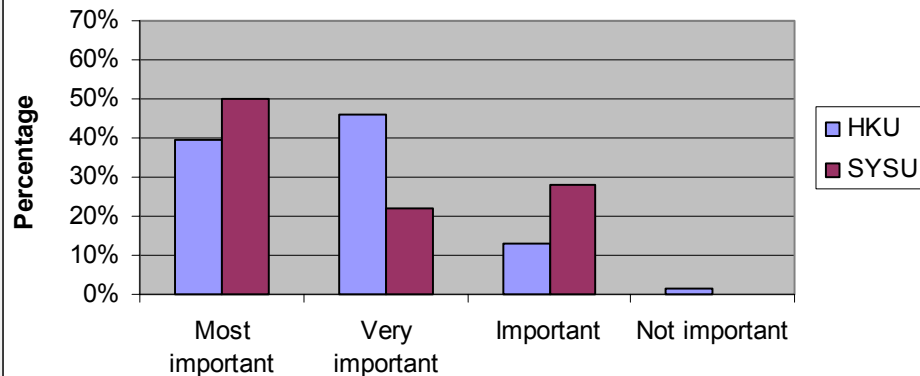
Importance to study of civil engineering:

Mathematics



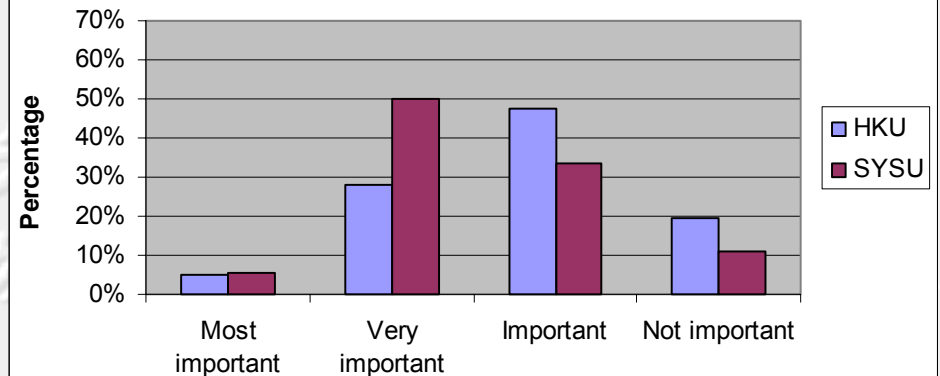
Importance to study of civil engineering:

Physics



Importance to study of civil engineering:

Computer literacy



Practice in Civil Engineering

Mathematics / Science

Language

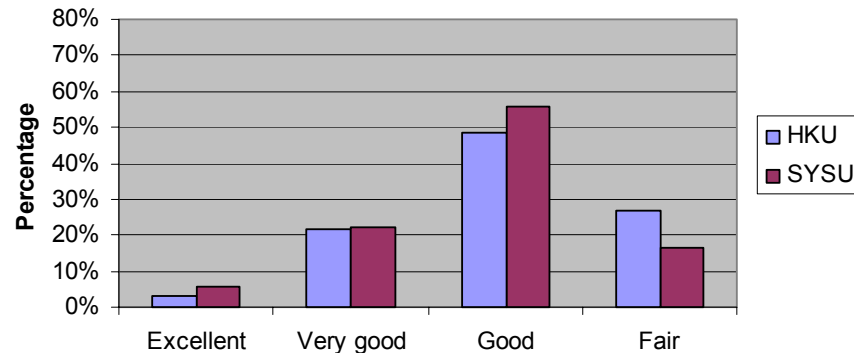
With time and experience



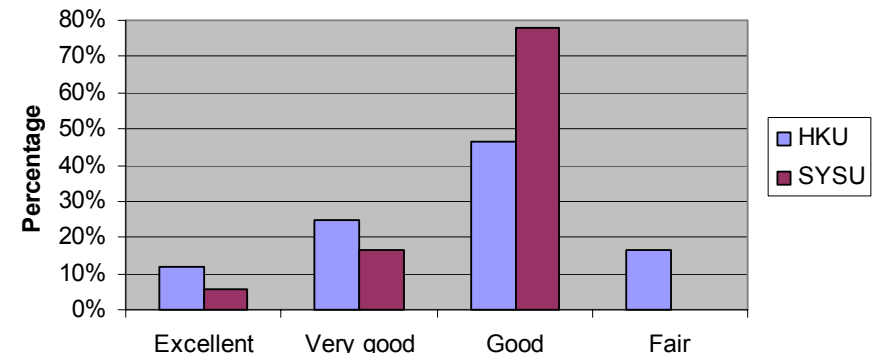
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Practice in Civil Engineering - Confidence

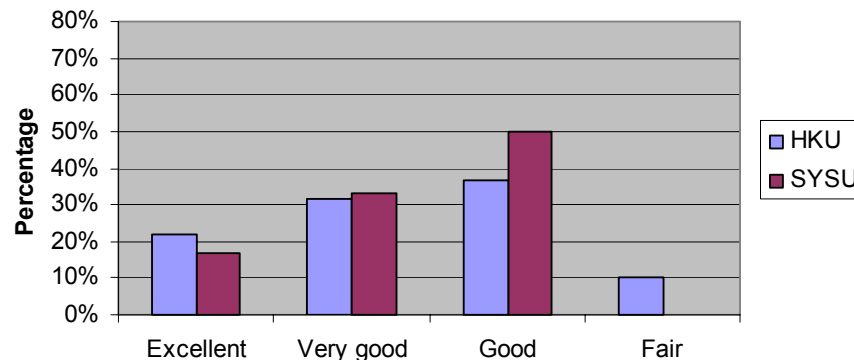
Self-assessment in civil engineering practice in an English-speaking environment



Self-assessment in civil engineering practice in an Chinese-speaking environment

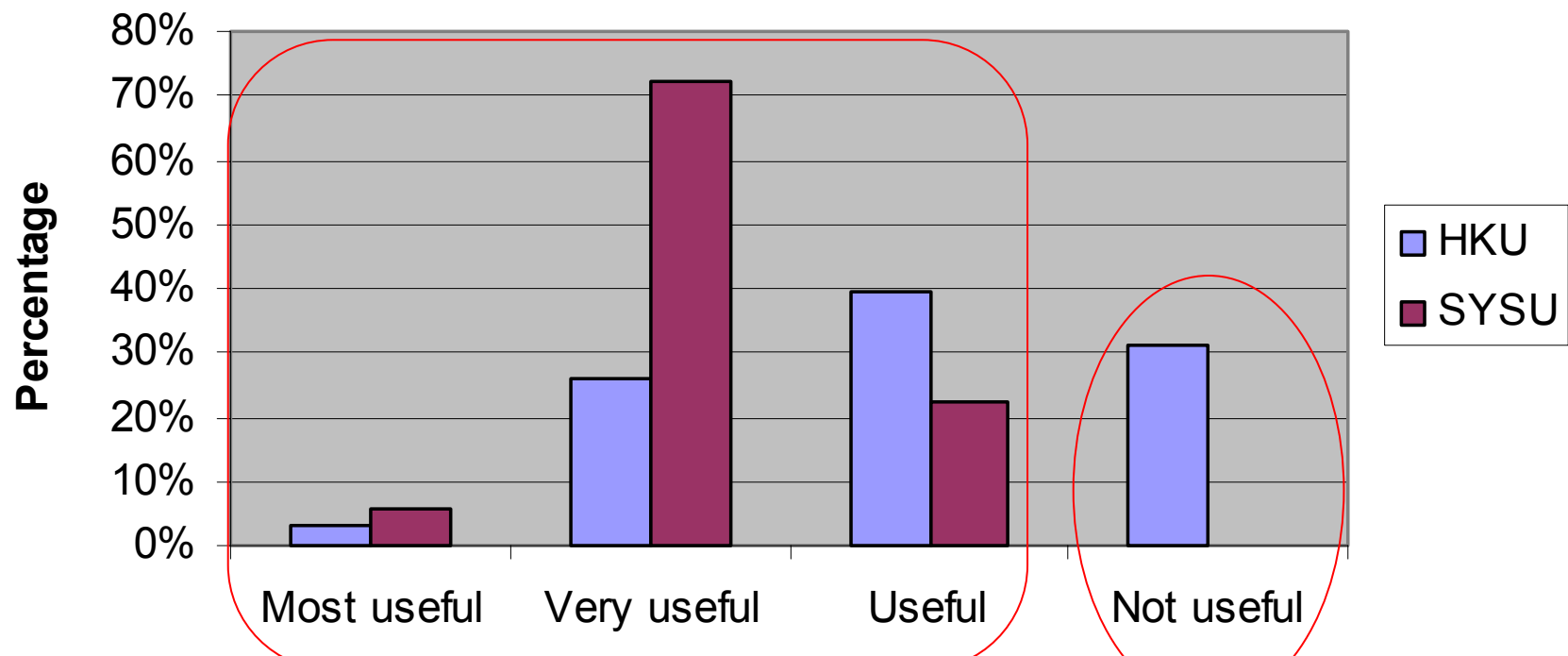


Self-assessment in civil engineering practice in a mixed language (Chinese-English) environment



Usefulness of the course in enhancing English capability

Usefulness of the course in enhancing capability in the use of English

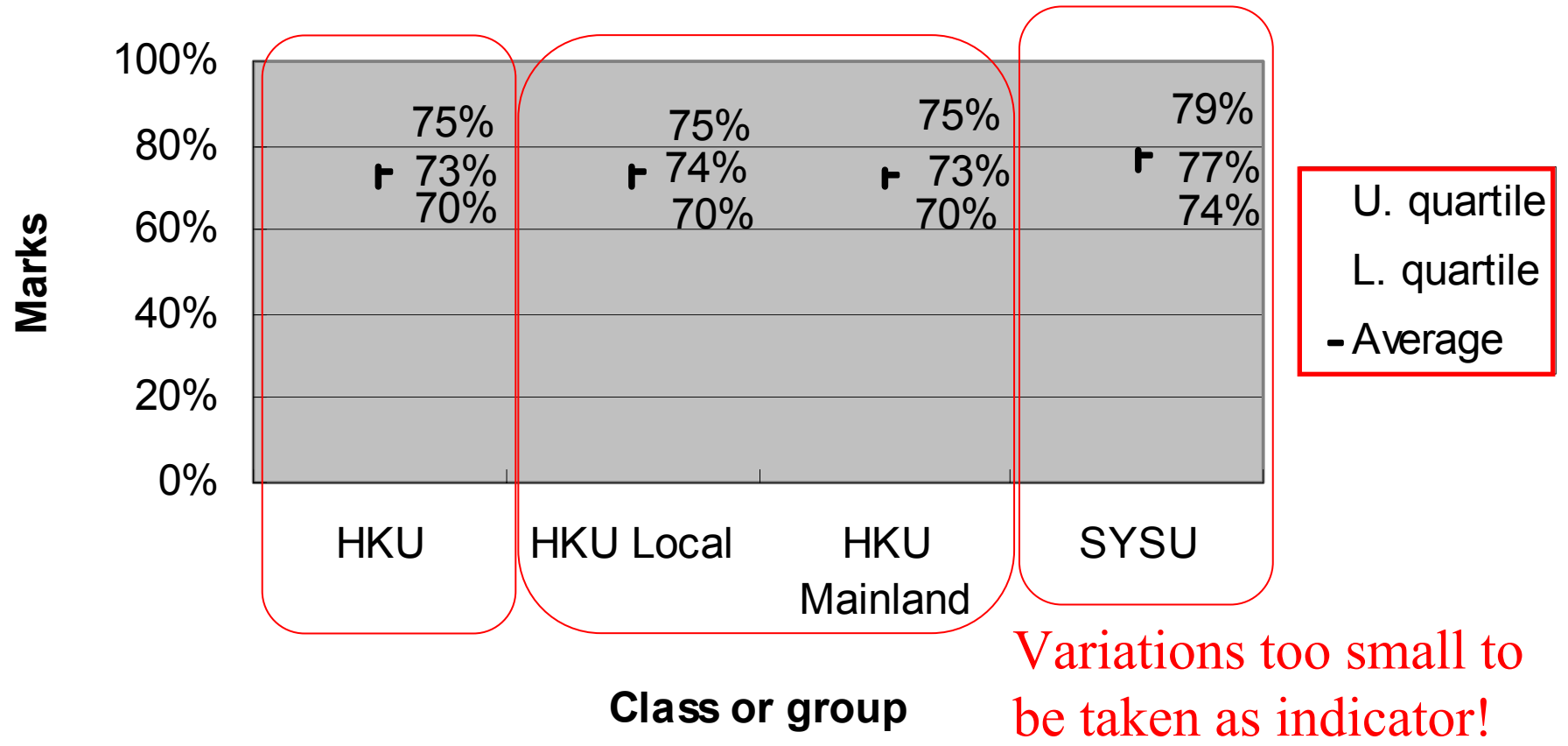


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Related to experience
in EMI learning

Coursework – Report on an existing structure

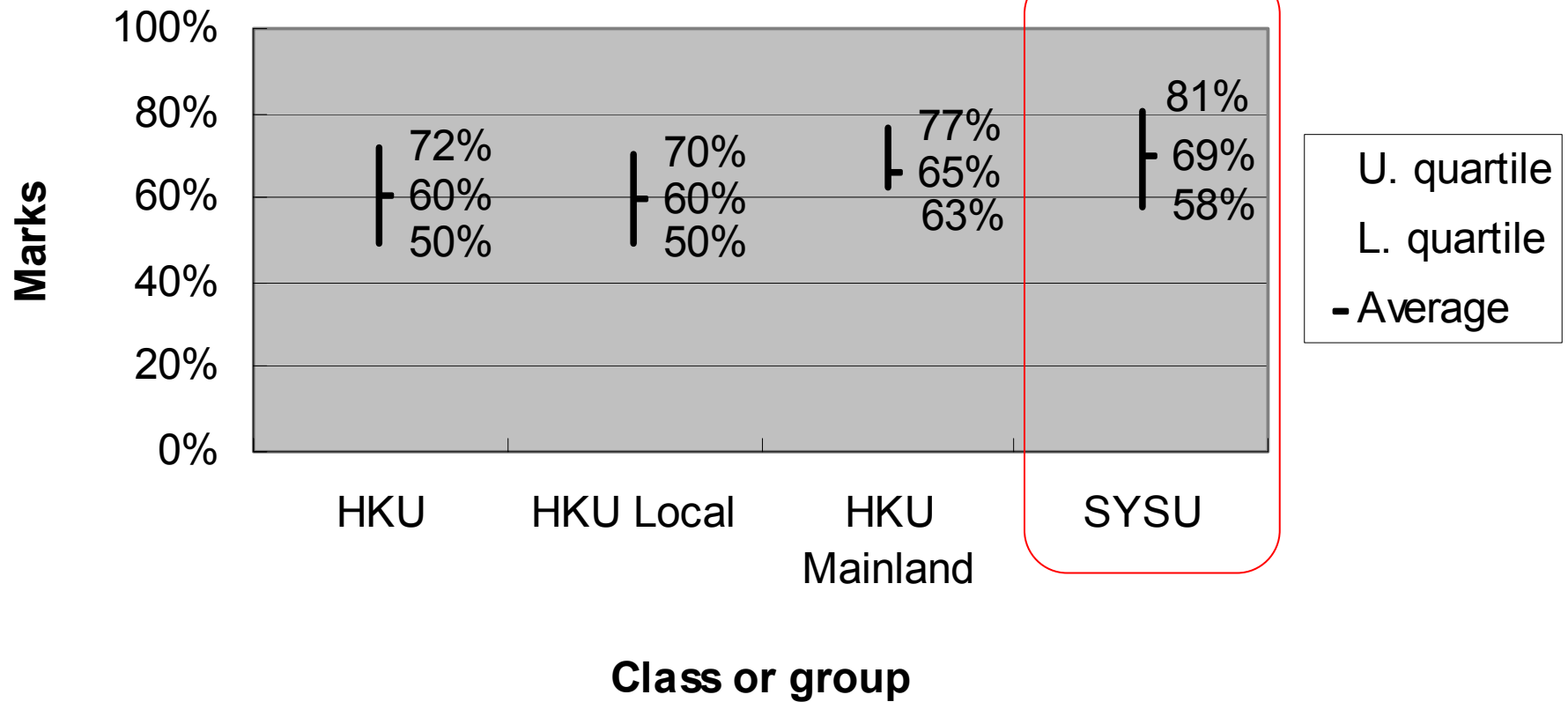
Report on an existing structure



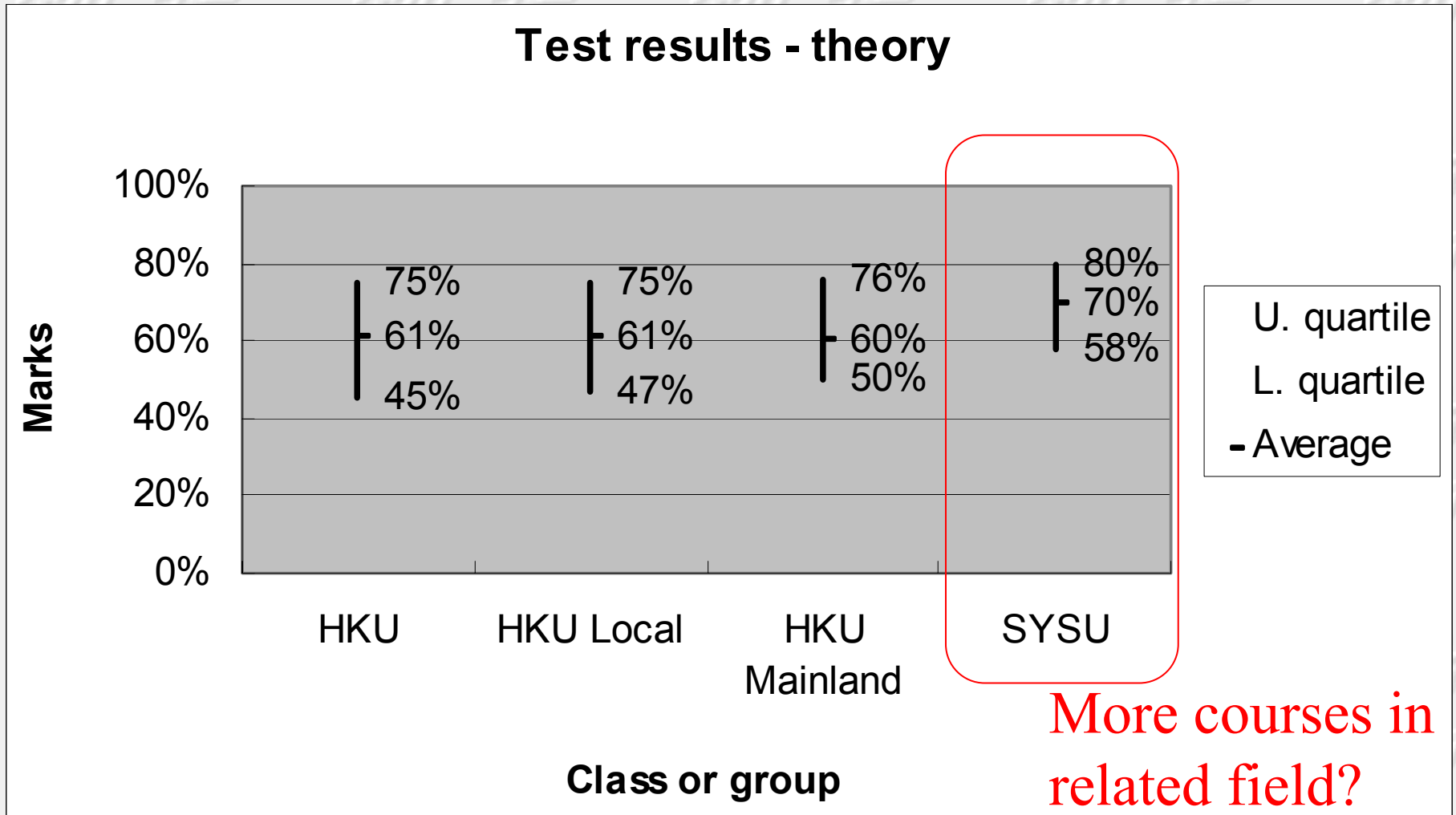
Test – Overall results

Overall test results

Difficult test!

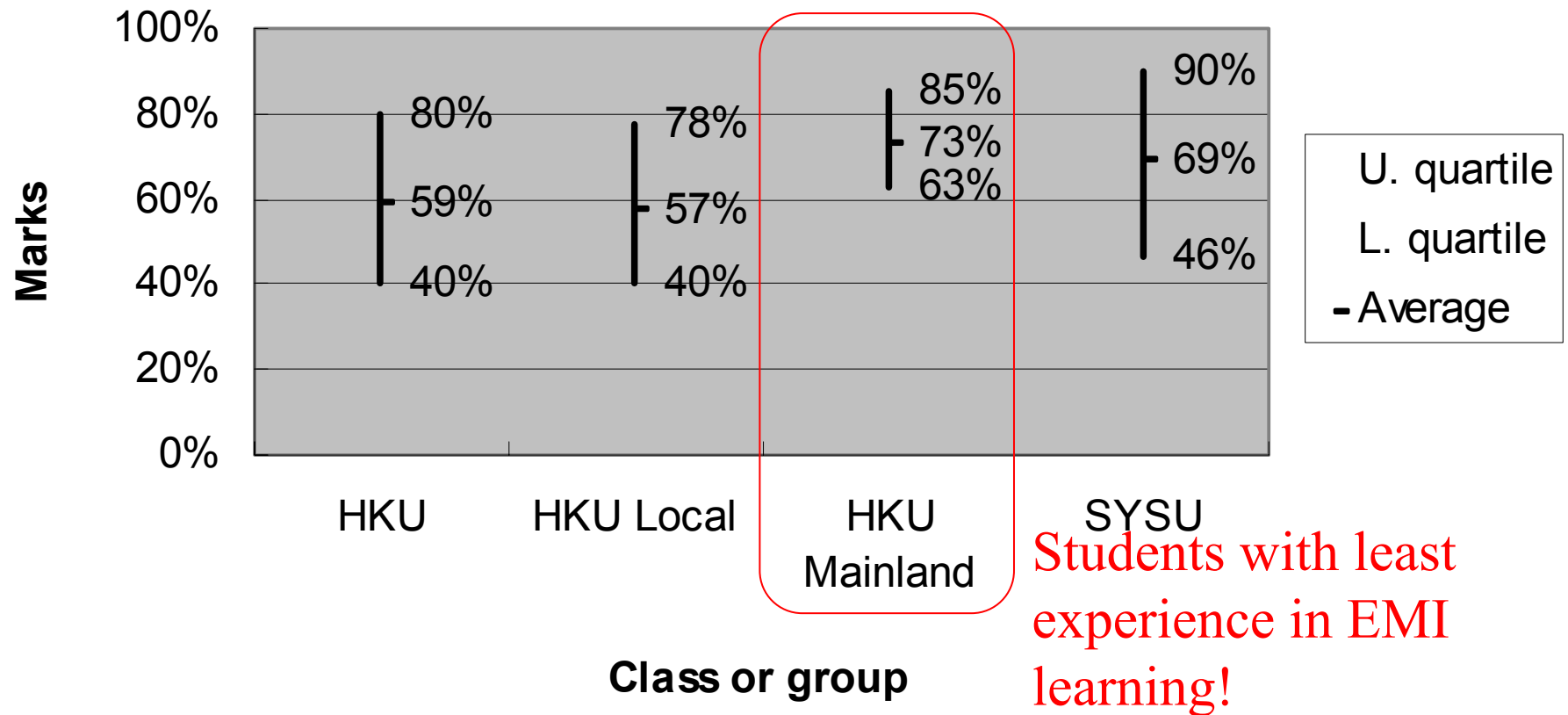


Test results – Theory



Test results – Essay type

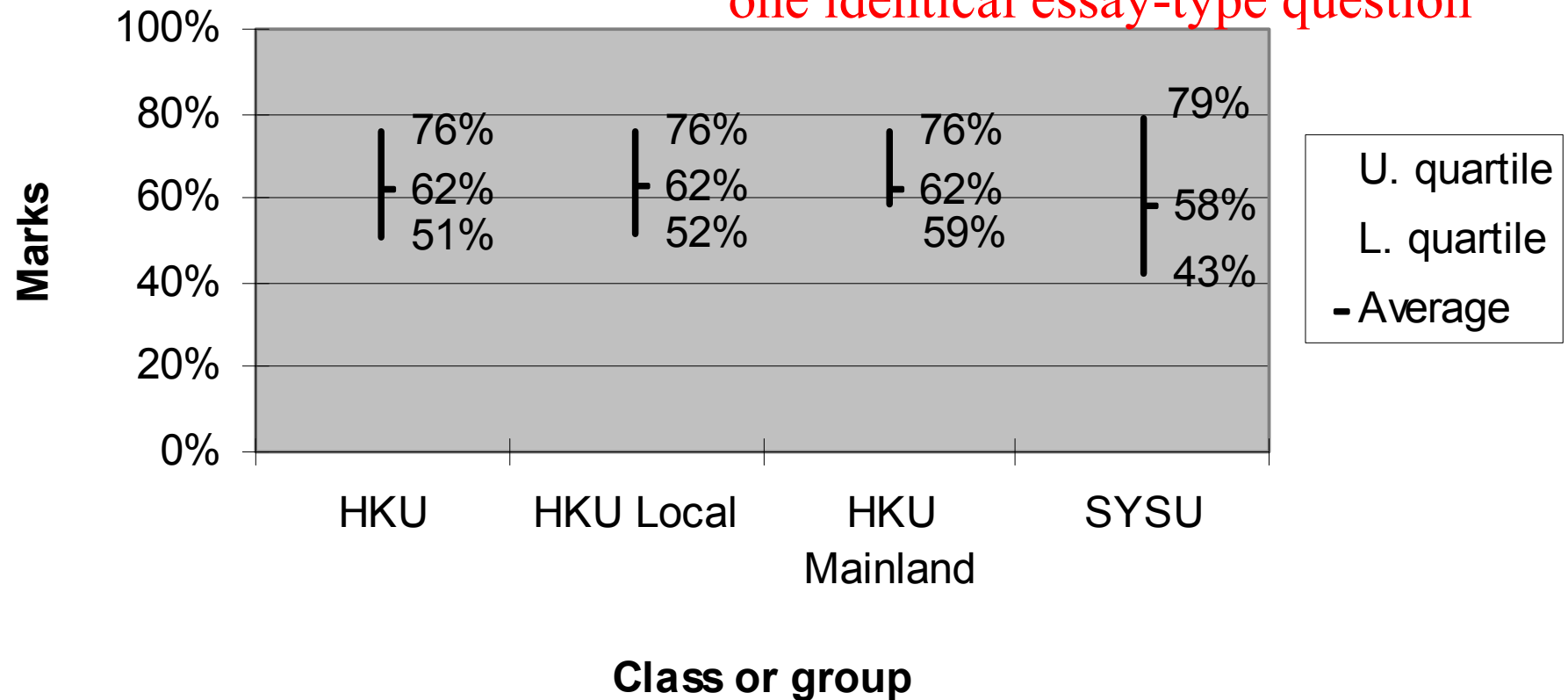
Test results - essay type



Examination – Overall results

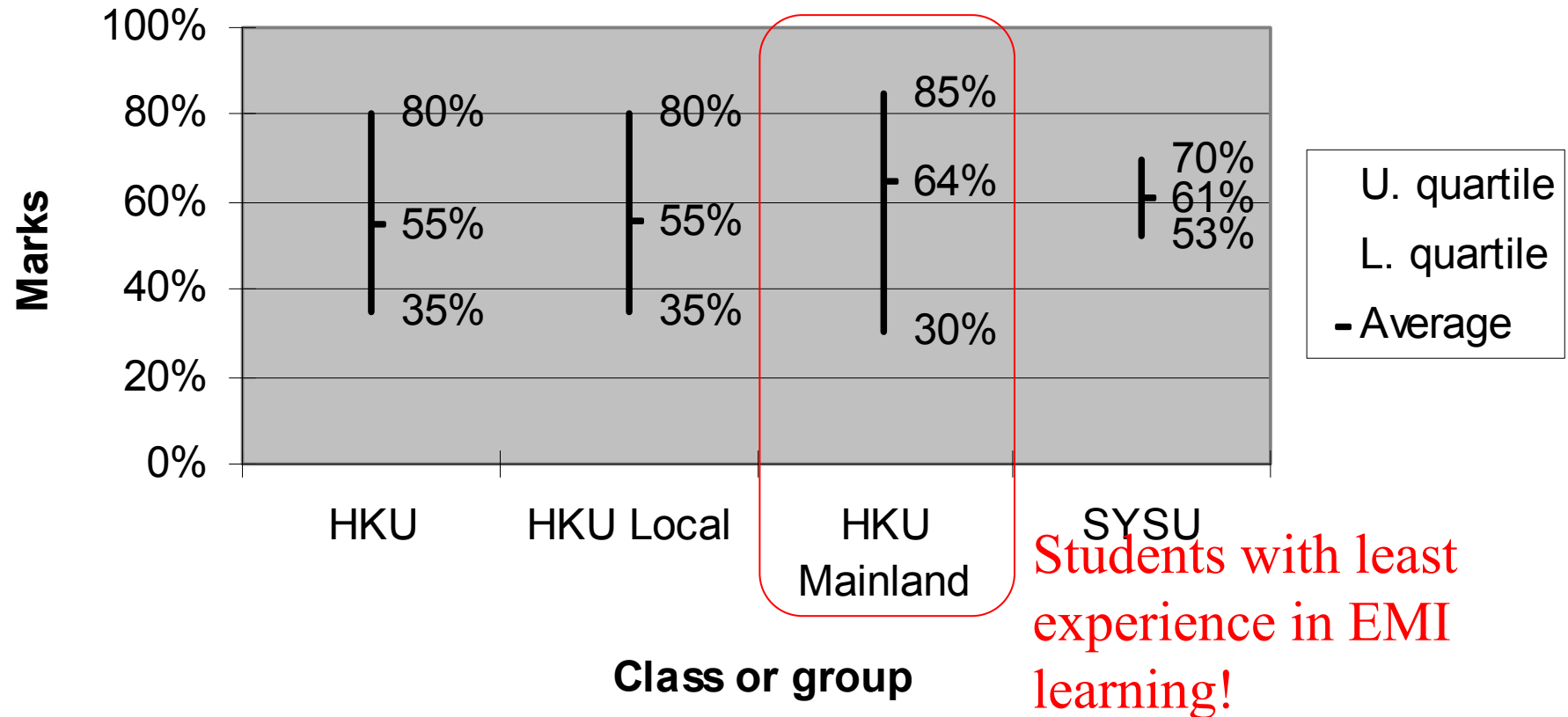
Overall examination results

Papers of comparable difficulty and one identical essay-type question



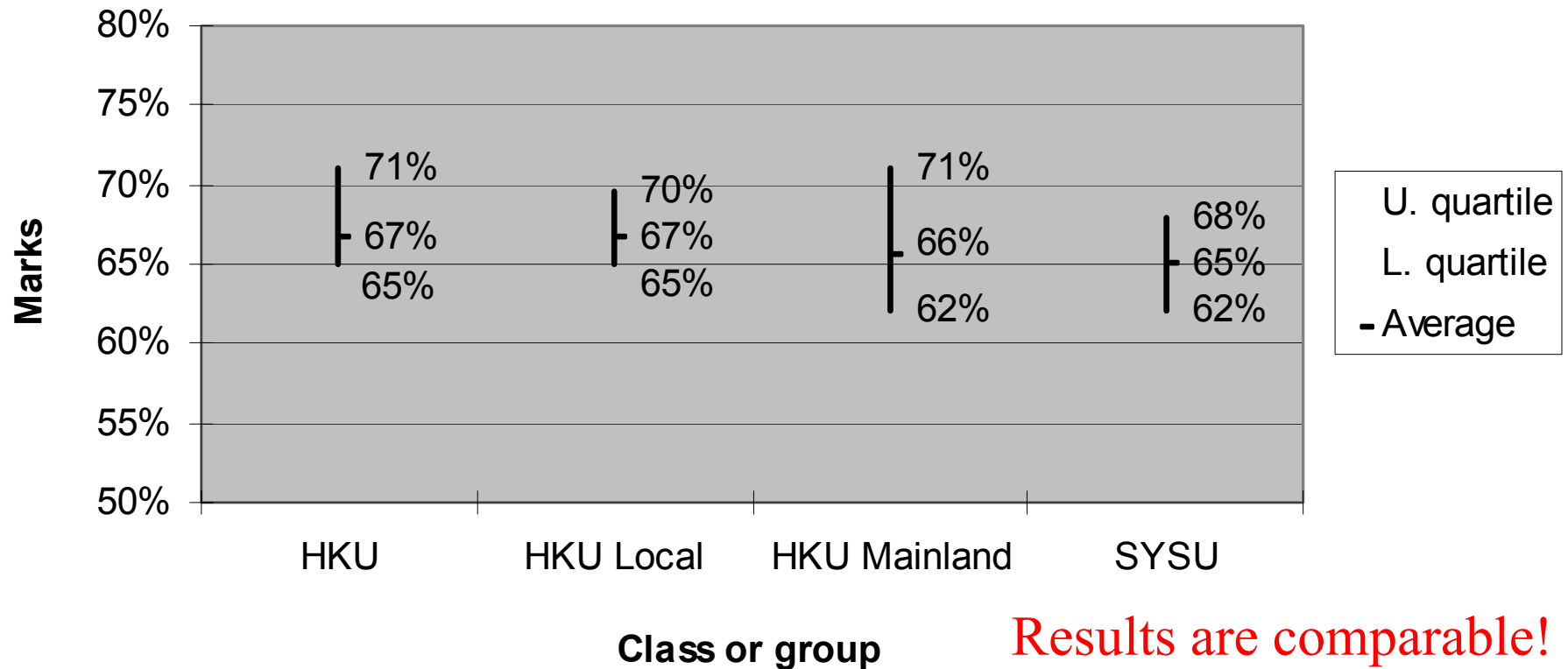
Examination results – Essay type

Examination results - essay type



Professional and technical written communication for engineers

Results of English course



Effect of language capability on learning

Correlation analysis is carried out on results

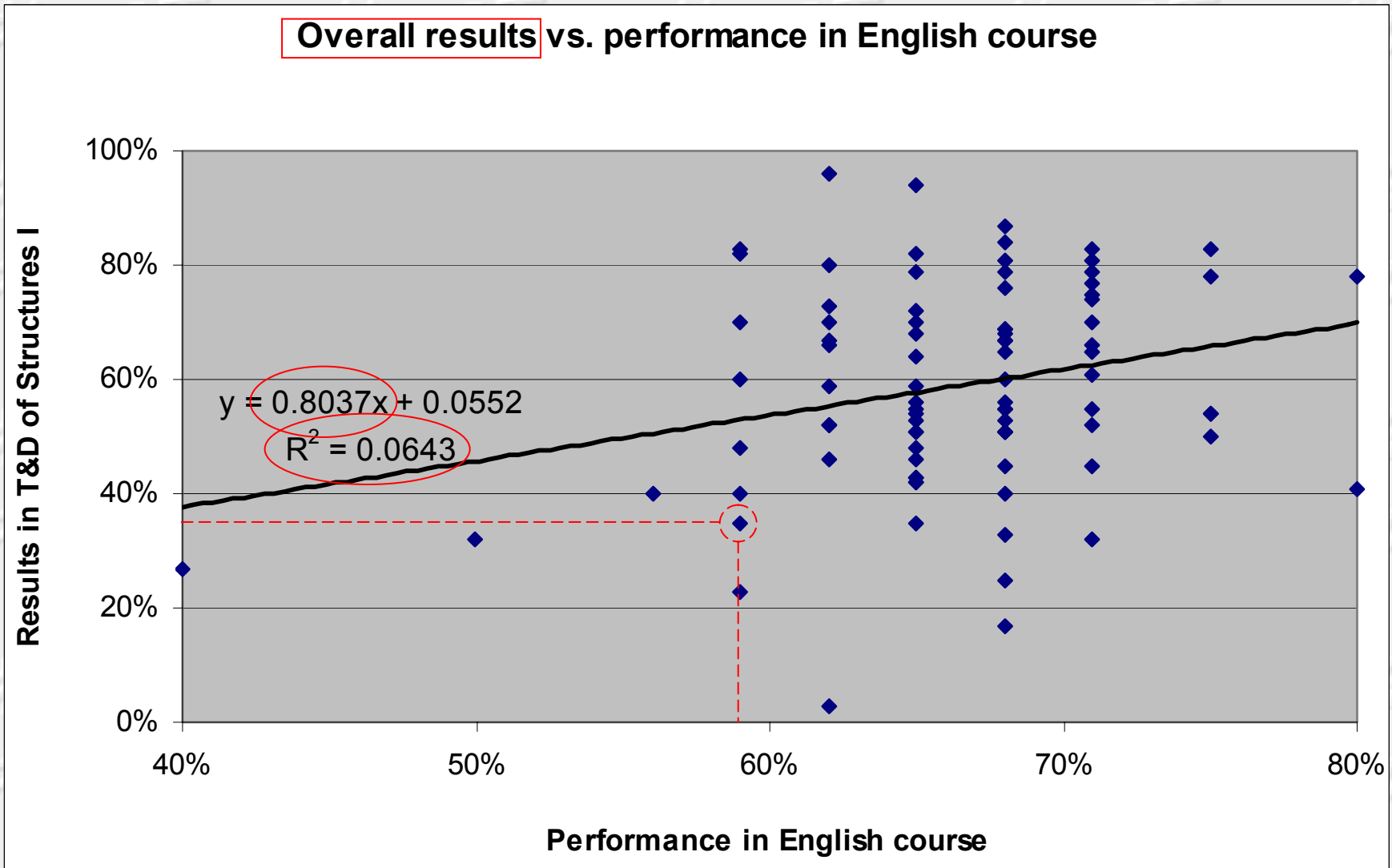
of courses:

- Theory and design of structures I
(by Department of Civil Engineering, HKU)
- Professional and technical written communication for engineers
(by English Centre, HKU)

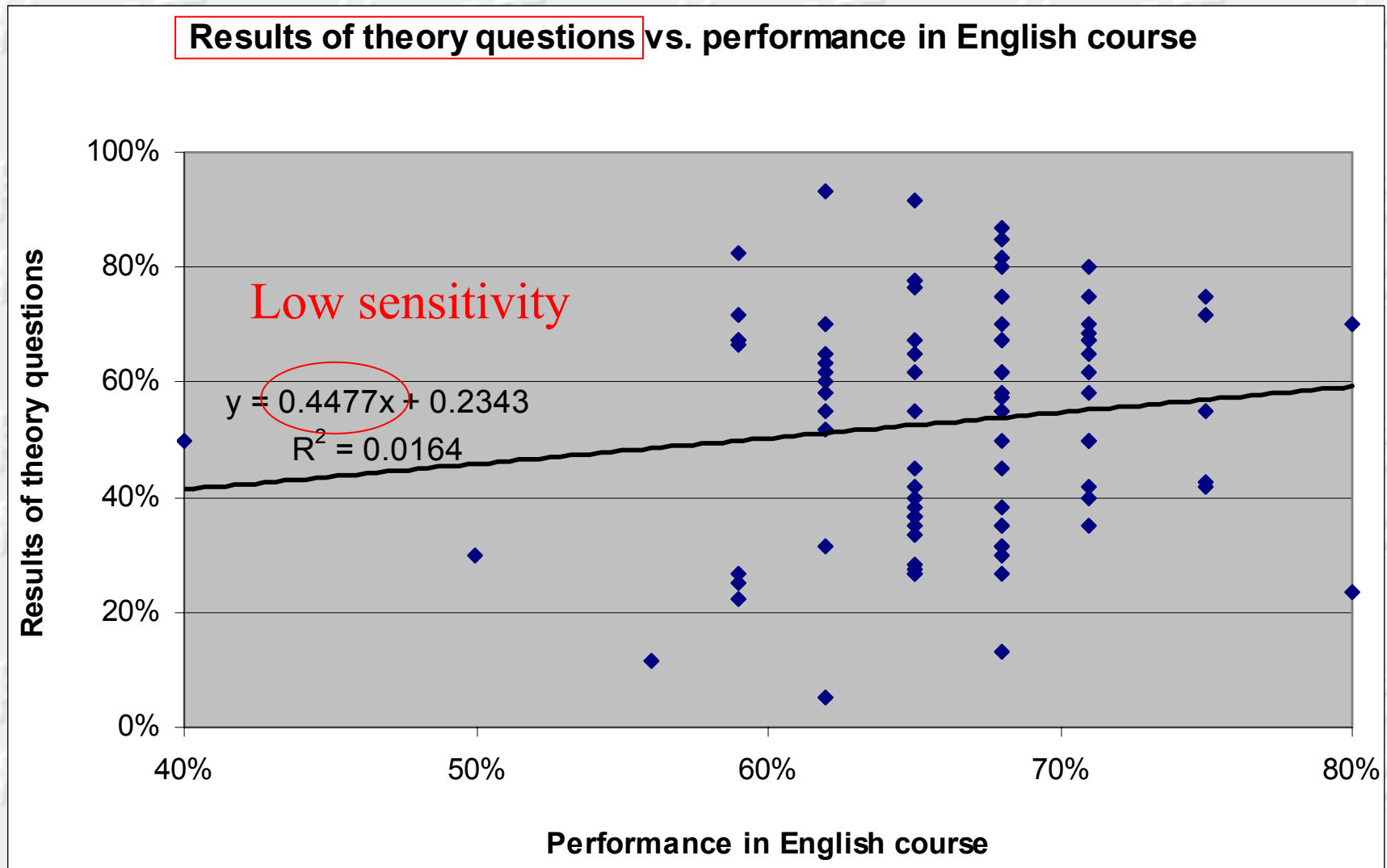


Effect of language capability on learning

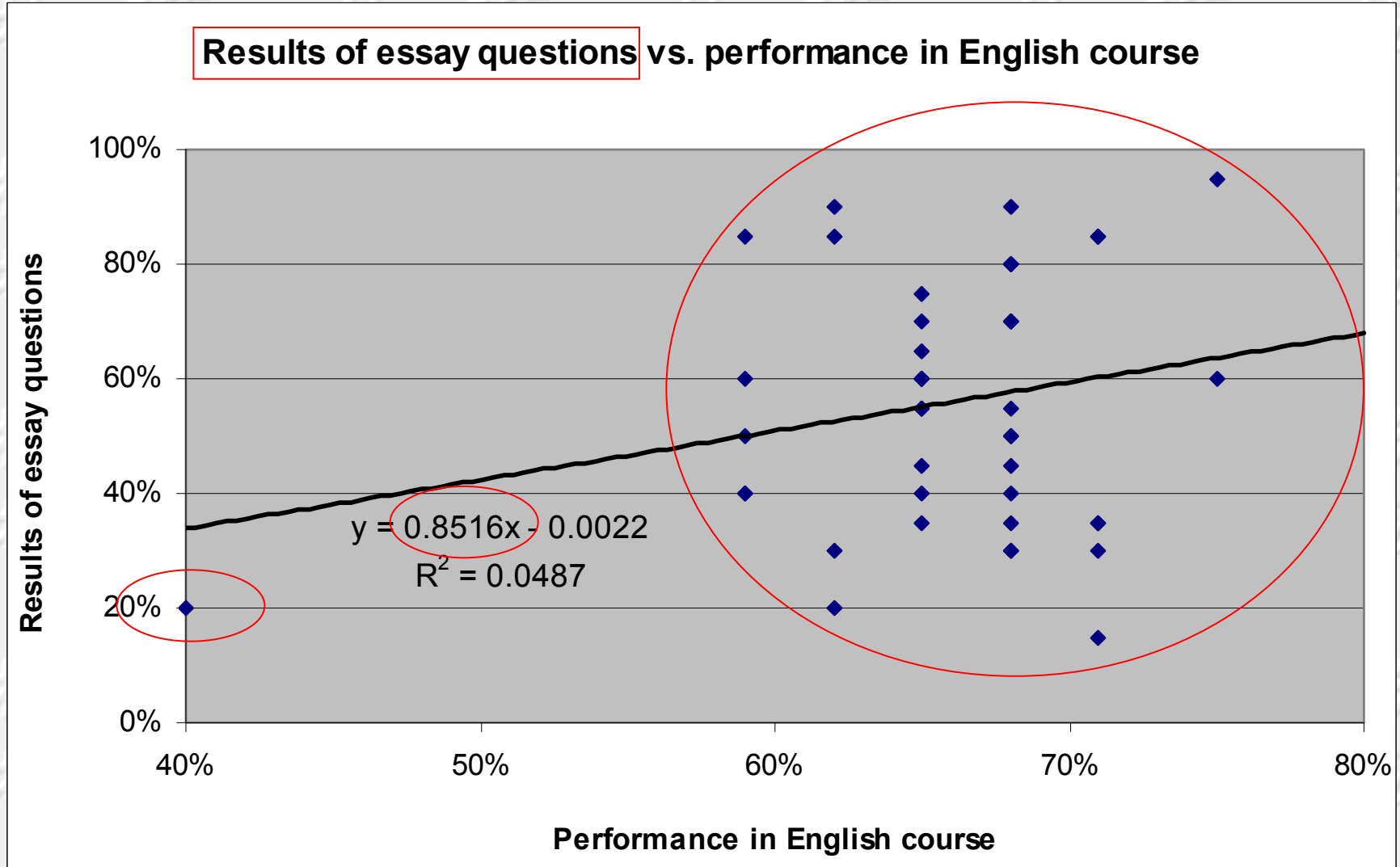
Overall results vs. performance in English course



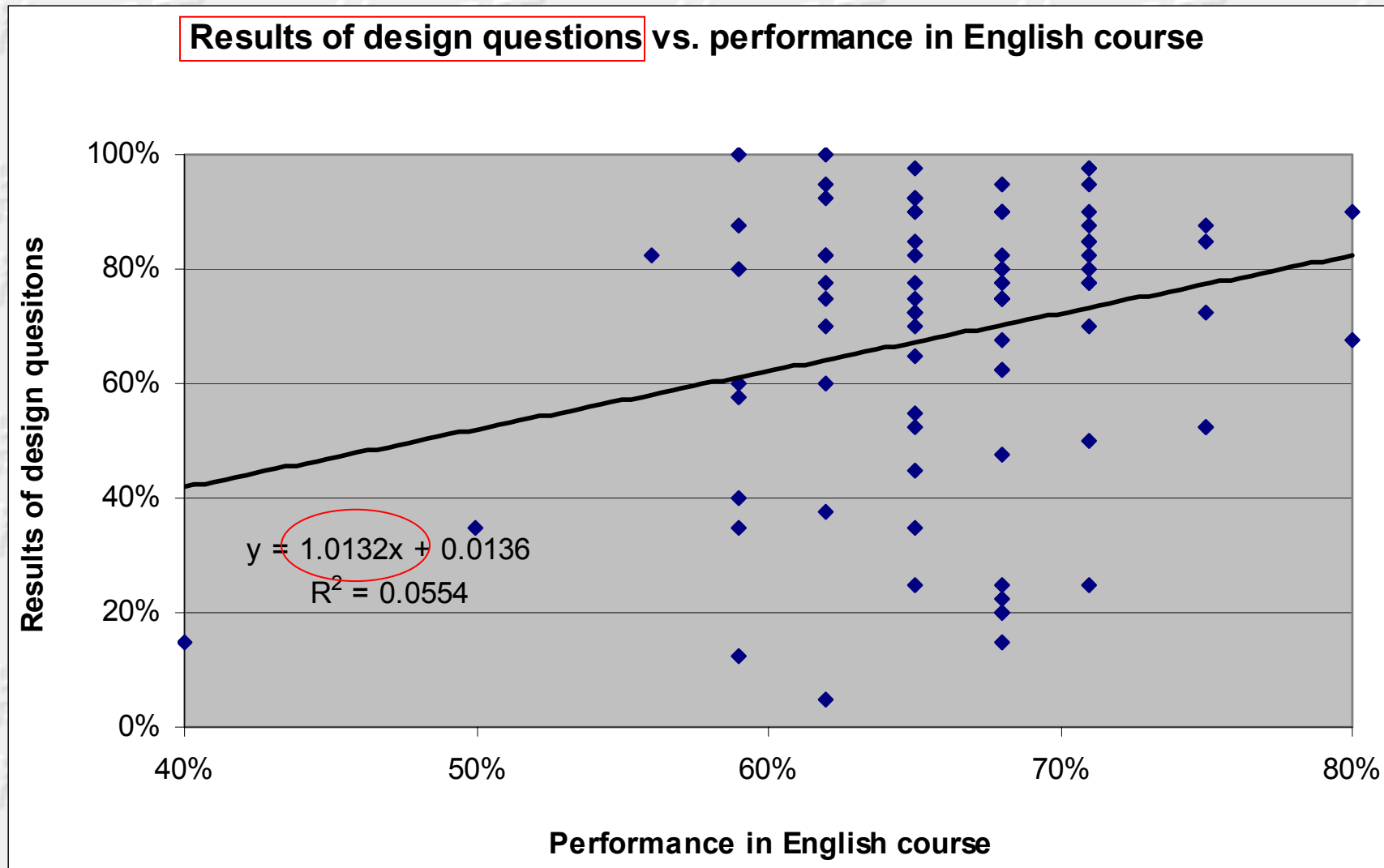
Effect of language capability on learning



Effect of language capability on learning



Effect of language capability on learning



A series of courses on T & D of Structures

- Theory and design of structures 1
- Theory and design of structures 2
- Theory and design of structures 3

Intermediate course with
much more contents in
mathematics and science

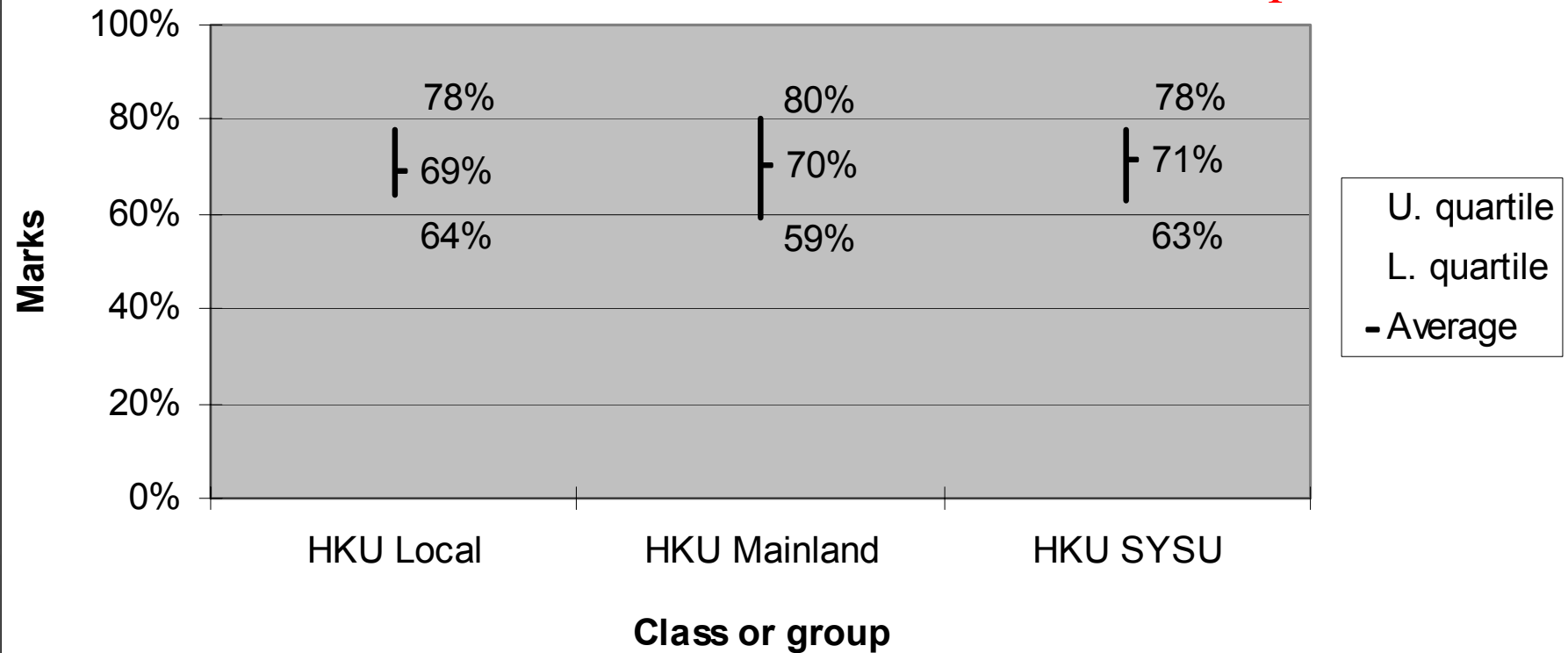
Basic course
examined in
this presentation



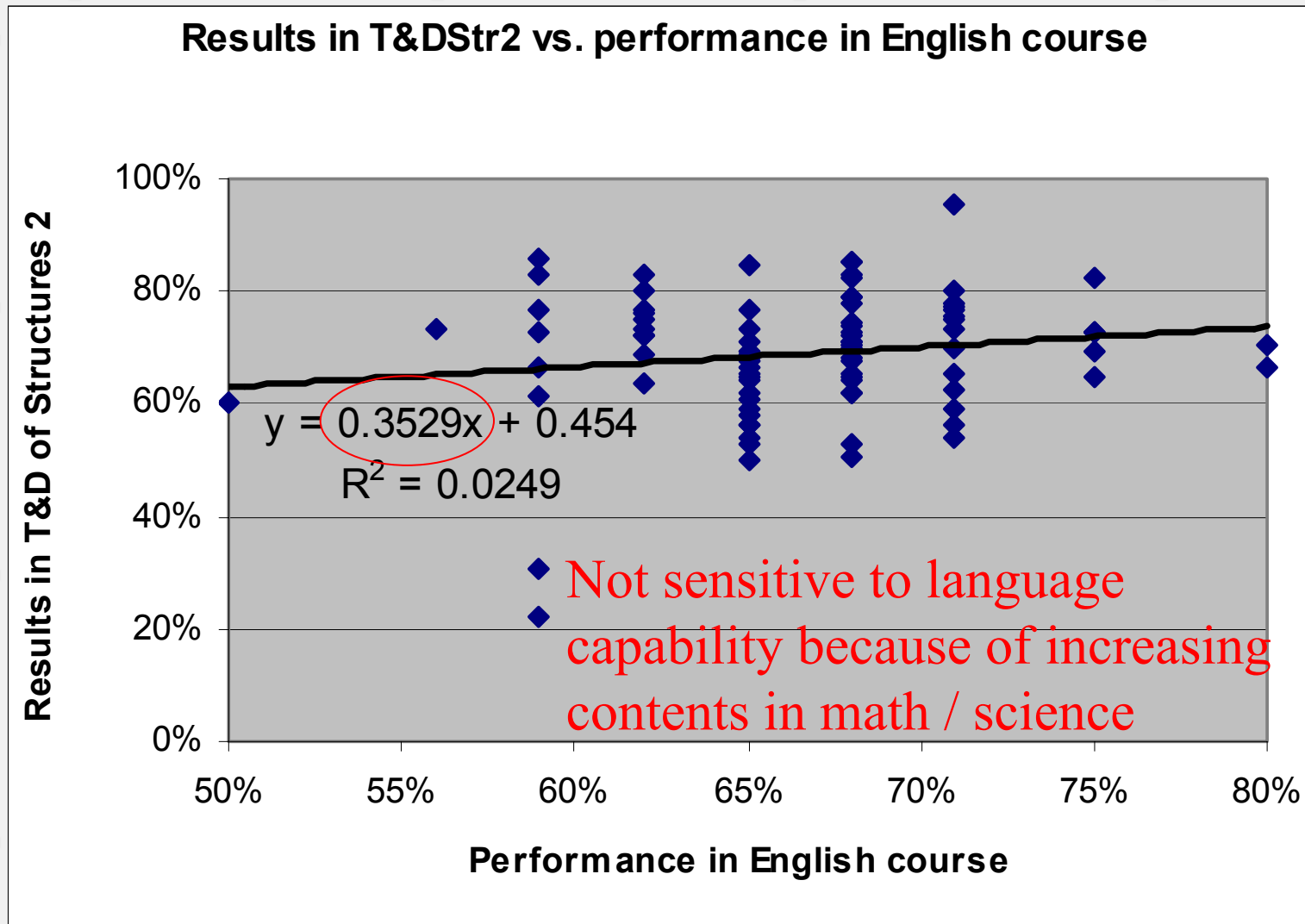
Next course in the series: T&D of Structures 2

Results of Theory & Design of Structures 2

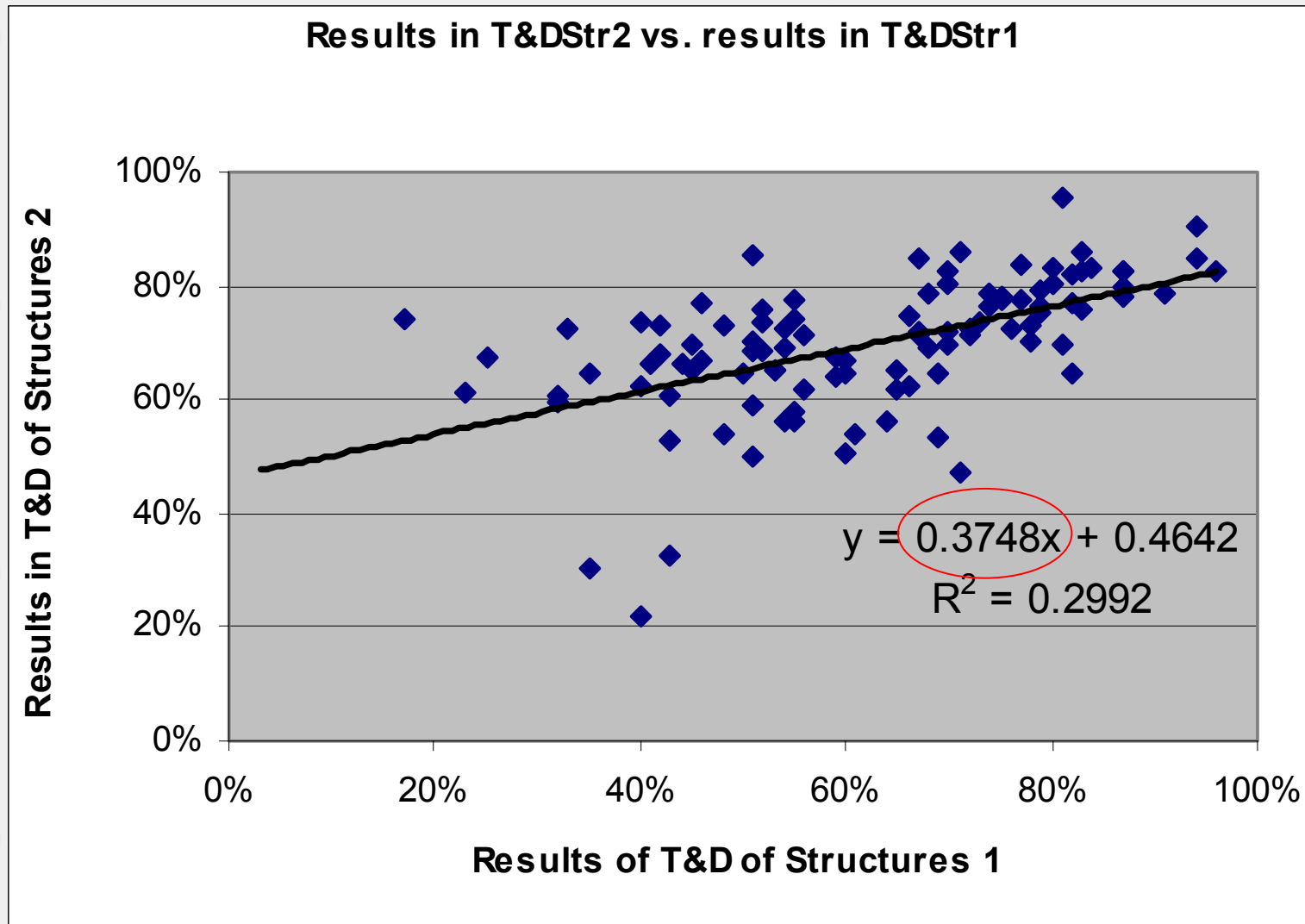
Comparable performance!



Next course in the series: T&D of Structures 2



Next course in the series: T&D of Structures 2



Conclusions

Although the data collected are not yet conclusive, some conclusions can still be inferred:

- The two important factors in learning civil engineering are:

- (a) language(s); and

- (b) mathematics / science.

- Although the correlation of the data is not strong, language capability is still seen to enhance learning various topics in civil engineering.



Conclusions

- Language capability affects to various extent the study of different areas of civil engineering.
- The students examined in the study have different experience in learning in English, Chinese and a combination of the two. Provided that they have passed a certain threshold of language capability, the difference in subsequent performance is minimal.



Conclusions

- Using English as the medium of instruction in learning enhances the capability in the use of English, especially in the first few years.



Thank you!



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