Skills Required for Learning Introductory Statistics in Transnational Education: a test to detect weaknesses

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Problems in teaching IS: math skills

- Introductory Statistics (IS) is taught in many programs in which mathematics is not a prerequisite (*e.g.* Psychology and Biology).

- For this reason, the problems connected with the teaching and learning of IS is broadly relevant.

- Students with weak mathematical bases tend to lag behind and lose motivation.

- In fact, IS courses are often plagued with high failure rate and the reputation of being *hard.*

Basic math skills are crucial

- There is evidence. In particular:

- Johnson and Kuennen (2006) and Lunsford and Poplin (2011) introduced a Test for Basic Mathematics for IS students

- Both found that math skills and final results in IS are highly correlated

Problems in teaching IS: Language

- English language Learner (ELL) students have the additional problem of language difficulties.

- This has been observed with Hispanic students in the States, for example.

- In transnational education the language problem is surely relevant because all students are ELLs.

Effects of language problems

- "*Unfortunately, most teachers have not had training in how to teach to ELLs*"

- "*[…] and this may be exacerbated if students are reluctant to ask for a concrete example or paraphrasing.*"

- "*Such students may temporarily stop listening to the instructor or they may just continue listening despite having missed crucial key words.* "

- Lesser and Winsor, 2008

Language Skills

Lesser and Winsor distinguish between

1. BICS (Basic Interpersonal Communicative Skills)
2. CALP (Cognitive Academic Language Proficiency)

   complex decontextualized academic situations

   They also consider

Register = *a subset of language used for a particular purpose*
   students with a good statistical register in their own
   language of education are more likely to acquire that
   register in English quickly

Types of language difficulties

No Math and NO BICS

3+2 = ??

Sum ??

Types of language difficulties

No Math and BICS English

3 + 2 = ??

A difficult sum

Types of language difficulties

Good Math
(with Vietnamese Math register)
No BICS English

$$\lim_{n \to \infty} \left(1 + \frac{1}{n} \right)^n = e$$

I know not English

Giới hạn của quyền lực!

Giovanni Merola

Types of language difficulties

Good Math and good English BICS but NO English Math register

$$\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n = e$$

I speak English very well.

Giới hạn của quyền lực!

Limit of a power?

Detection of language weaknesses

- We expanded Johnson and Kuennen's test developed for testing math Skills

- We added the translation in Vietnamese of ten questions containing math key words.

- This should test for
  - BISC in English
  - Mathematical register in Vietnamese
  - Mathematical register in English

A possible question for BICS

- Hien spends <u>one third</u> of her money for <u>a pizza and half</u> of the remaining money for a soft drink. At the end, $10 is left in her pocket. How much is the pizza?

  a. $5   b. $10   c. $15   d. $20

- Số tiền Hiền mua bánh pizza chiếm hết một phần ba tổng số tiền Hiền có, và số tiền mua nước uống chiếm hết một nửa số tiền còn lại sau khi mua pizza. Mua xong Hiền còn lại $10, vậy Hiền đã trả hết bao nhiêu tiền cho bánh pizza?

  a. $5   b. $10   c. $15   d. $20

This would check for lack of BICS for someone with math skills

# A question for Stats register

- A student scored 45, 55, 35 and 60 in four exams. What score does he need in the fifth exam in order to achieve an <u>average score equal to 50</u>.

  a. 45   b. 50   c. 55   d. 60

- Một học sinh được 45, 55, 35 và 60 điểm trong bốn bài thi khác nhau. Học sinh đó cần được bao nhiêu điểm trong bài thi thứ năm nếu muốn được điểm trung bình là 50 điểm sau năm lần thi?

- 45   b. 50   c. 55   d. 60

Extent of the test

- The test was administered to 320 first year students of the commerce program in their first IS class

- Most of this students were in the Bachelor degree others in the Diploma degree (lower IELTs and high school GPA)

- The test was not mandatory and students were explained it was only for research purposes and its results would not affect their performance in the course
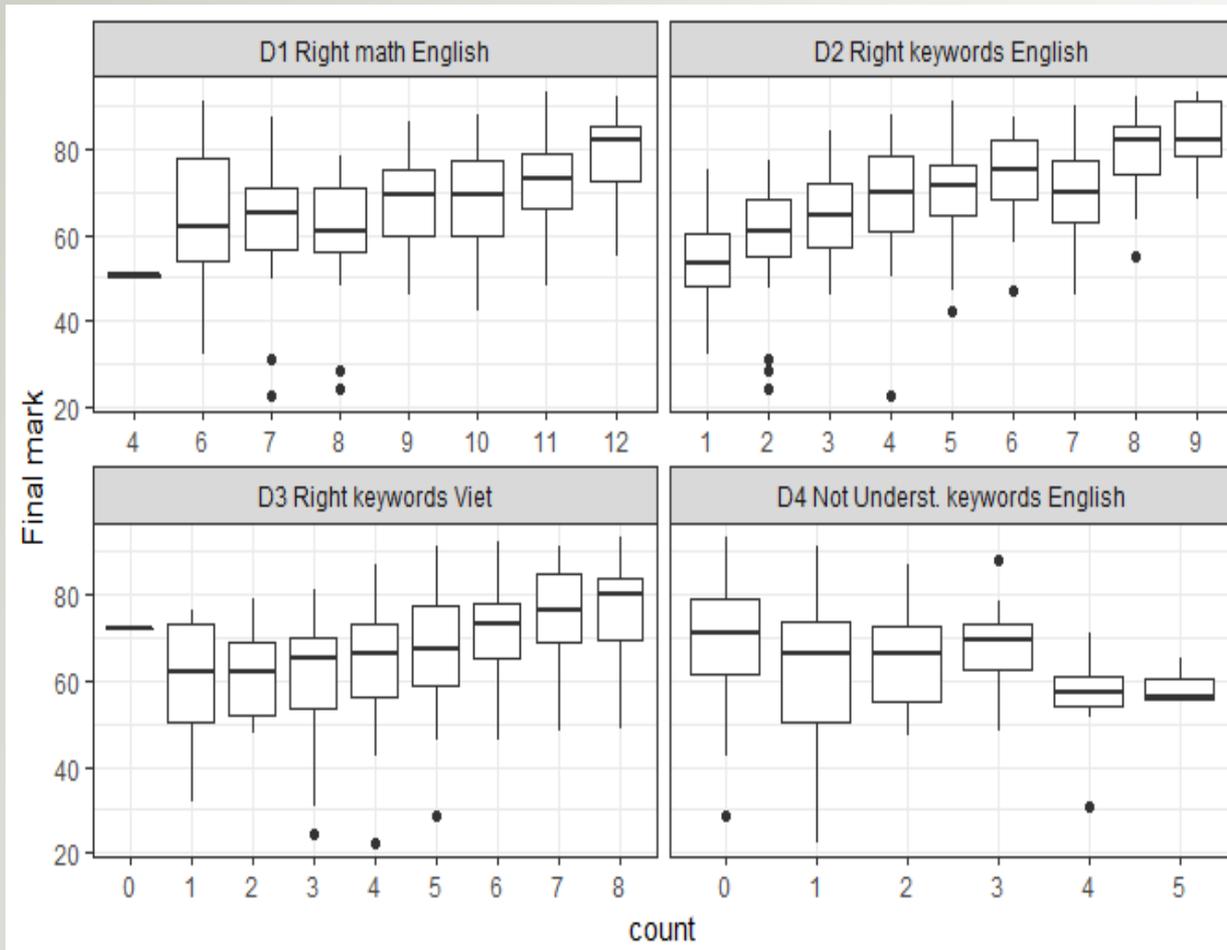
Results of the test

- Percentage Right answers + Don't understand

No KWords   Eng KWords   Viet KWords   Don't undrtnd
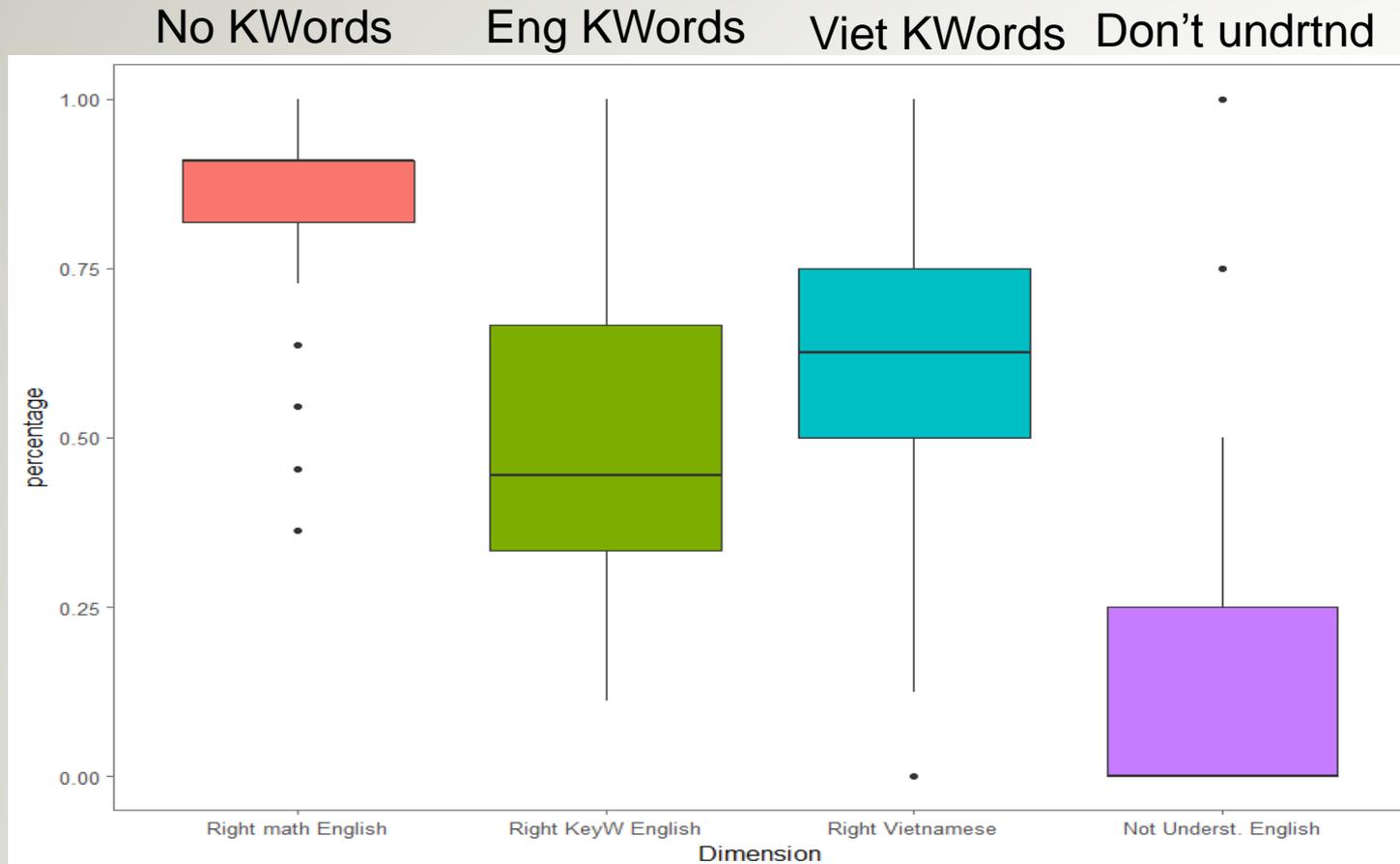
Comparison test with final marks

Final mark vs skill test results

Results of the regression

Coefficients	Estimate	Pr(>|t|)	Sig.
(Intercept)	37.3	< 0.000	***
No Key Words	12.2	0.0458	*
Eng Key Words	9.1	0.0329	*
Viet Key Words	9.3	0.0129	*
Gender (M = 1)	-3.3	0.0084	**
Attendance	0.2	< 0.000	***
Diploma/Bachelor (D=1)	-9.0	< 0.000	***
Repeat	-5.9	0.0494	*

Gender analysis

Skill test results
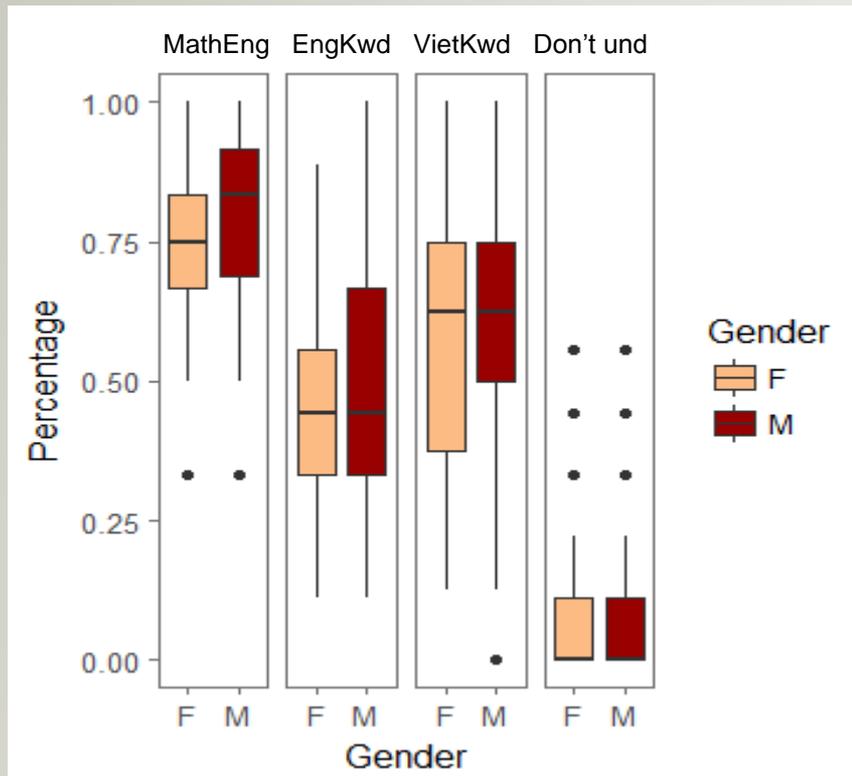
Course results
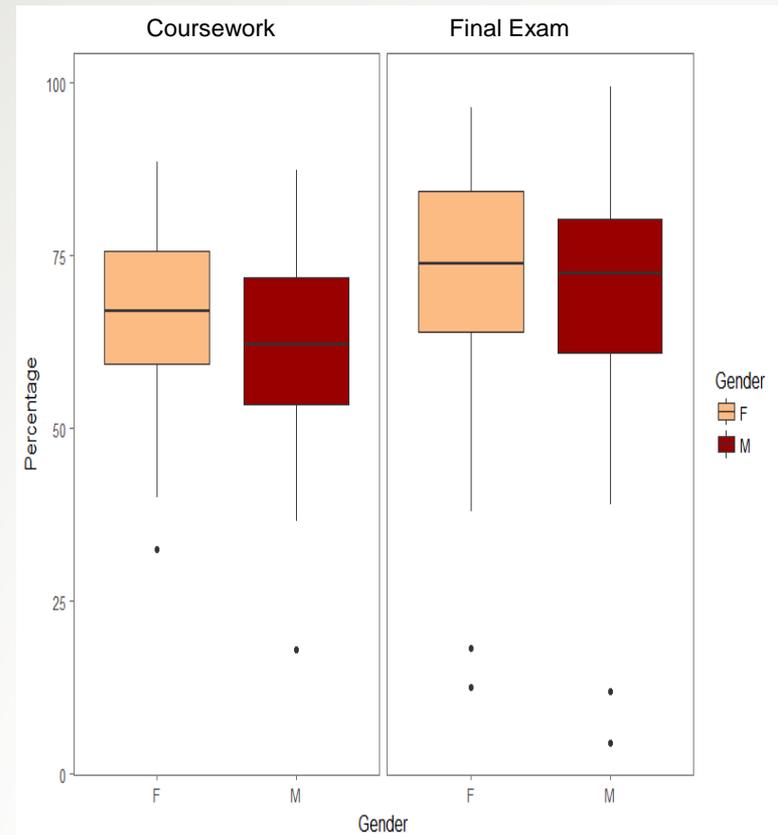
One million Yuan questions

- Don't know neither English nor math: what to do?

- Don't know math register: what to do?

Possible remedies (and difficulties)

- All lectures should be taped and available for students to listen to in the library. Nope (too much work + copyrights)

- Allow students to bring bi-lingual dictionaries into examinations. Nope (may hide notes)

- Lecturers should attempt to speak clearly and more slowly. (training)

- All lecturers should provide lecture notes. Nope (too much work)

- Students should be given clear and practical information of what a lecture, tutorial and workshop means and what is expected of them in these types of classes. (training)

Personal experience

- Active response (keep quality)

- Explain carefully jargon terms in class, useful

- We found LEAPS very useful when the trainer had an MS, less when not

- We had SLAMS (former HD students) mentors which didn't work very well (low attendance)

- Practical weekly labs with solved exercises worked well

Personal experience

- Passive response (AKA make it easier)

- Focus on practice: explain less and run classes as problem solving sessions

- Cut down content

- Easier tests

The end

Thank you for your attention

- Questions?

- Answers?