Are our students studying smart? Insights into the study strategies and metacognitive awareness of undergraduate students in Spain and the UK

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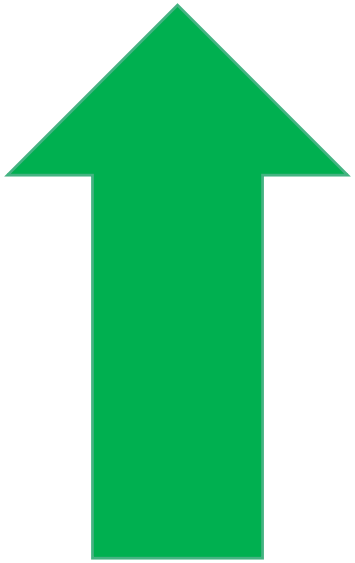
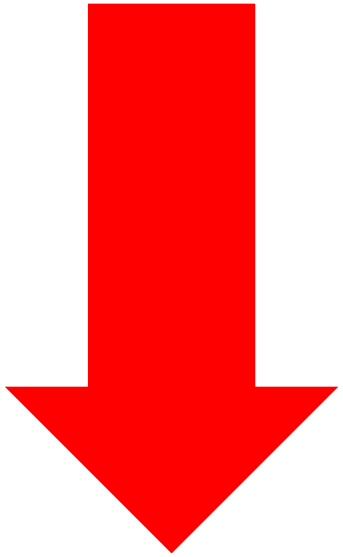


Meaningful Learning

1. Well organised, relevant knowledge structure
2. Seeks relationships between new and existing concepts



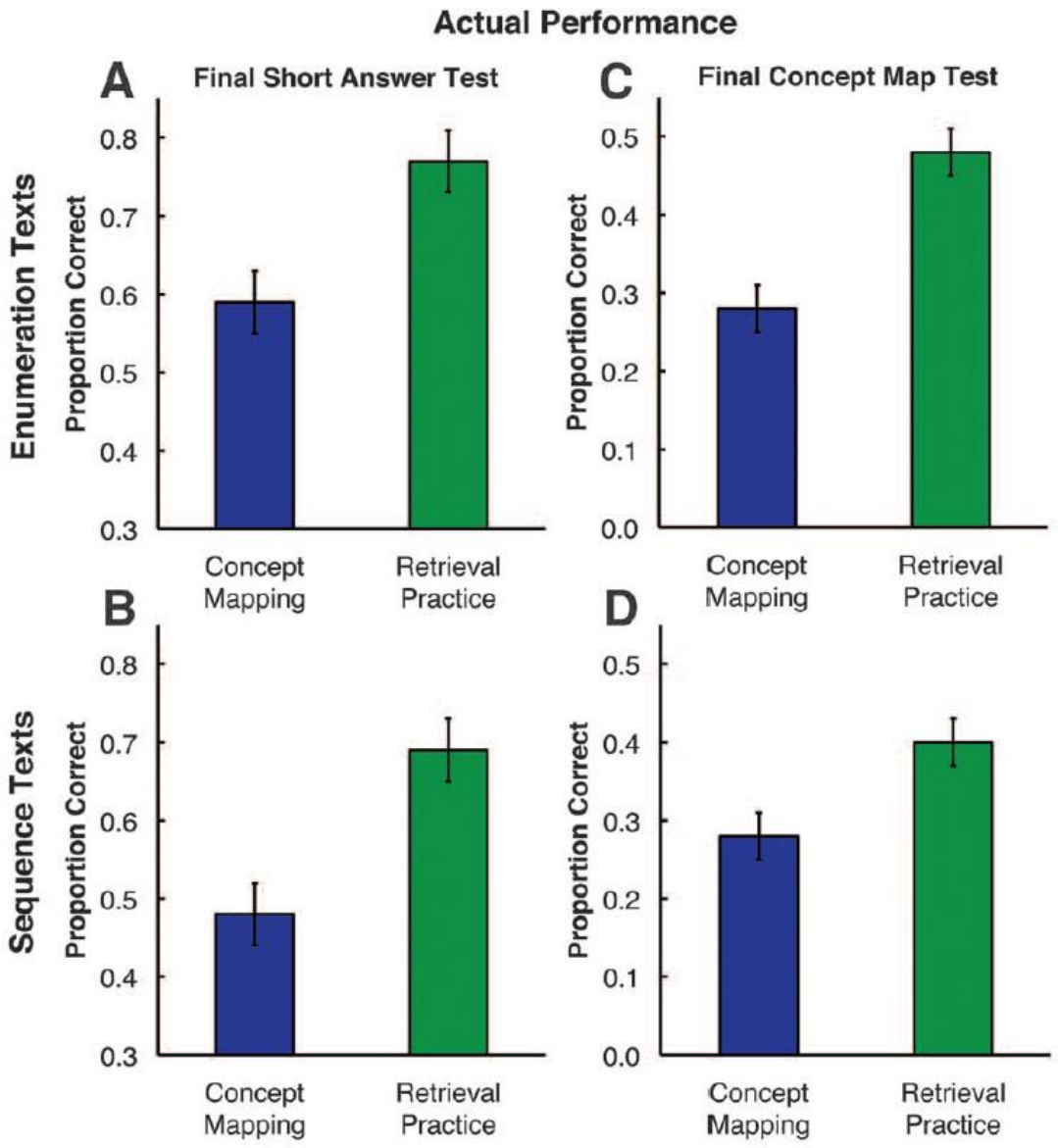
Rote learning

1. Little relevant knowledge structure, poorly organised
2. Lacks integration of new and existing knowledge

Novak, J. D. (2002). Meaningful learning: The essential factor for conceptual change in limited or inappropriate propositional hierarchies leading to empowerment of learners. *Science Education, 86*(4), 548-571.

Bretz, S. L. (2001). Novak's theory of education: Human constructivism and meaningful learning. *Journal of Chemical Education,* 78(8), 1107.

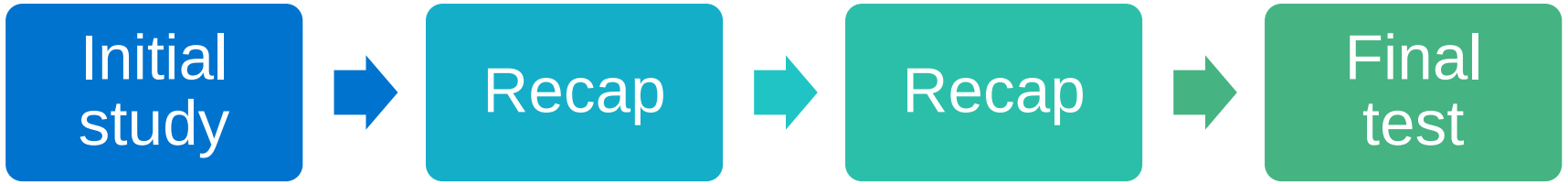
Retrieval Practice



The testing effect - after an initial study period, taking a practice test improves long-term retention compared to not taking a test and compared to restudying the learning material.

Karpicke, J. D., & Blunt, J. R. (2011). Retrieval practice produces more learning than elaborative studying with concept mapping. *Science*, 331, 772–775

Distributed practice



Cepeda, N. J., et al. (2008). Spacing effects in learning: A temporal ridgeline of optimal retention. *Psychological Science* 19(11): 1095-1102.

Rohrer, D., Dedrick, R. F., Hartwig, M. K., & Cheung, C.-N. (2020). A randomized controlled trial of interleaved mathematics practice. *Journal of Educational Psychology, 112*(1), 40

The Learning Scientists https://www.learningscientists.org/

This study

- Paper-based questionnaire Food Science and Technology (1st year Spain), Chemical Engineering (2nd year Spain), Pharmaceutical Science (1st year UK) and Pharmacy (2nd year UK)
- Time window of survey during 2019/2020 - between October 2019-January 2020
- The sample of 135 students were as follows: 1st year UK (n=34), 1st year Spain, (n=16), 2nd year UK, (n=49) and 2nd year Spain, (n=36)

Question	Answer Options	Number of students in Spain/number responding to item (%)	Number of students in UK/number responding to item (%)	p-value*
Q1. Would you say that you study the way you do because a teacher (or teachers) taught you to study that way?	Yes No	9/52 (17.3) 43/52 (82.7)	8/83 (9.6) 75/83 (90.4)	0.191

Key for Table: *Chi-squared test, #Fisher's exact test.

Question	Answer Options	Number of students in Spain/number responding to item (%)	Number of students in UK/number responding to item (%)	p-value*
Q2. How do you decide what to study next?	Whatever's due soonest/overdue	24/52 (46.2)	63/83 (75.9)	<0.001
	Whatever I haven't studied for the longest time	1/52 (1.9)	8/83 (9.6)	0.153#
	Whatever I find interesting	1/52 (1.9)	3/83 (3.6)	1.000#
	Whatever I feel like I'm doing the worst in	15/52 (28.8)	13/83 (15.7)	0.066
	I plan my study schedule ahead of time, and I study whatever I've scheduled	13/52 (25.0)	10/83 (12.0)	0.051

Key for Table: *Chi-squared test, #Fisher's exact test.

Question	Answer Options	Number of students in Spain/number responding to item (%)	Number of students in UK/number responding to item (%)	p-value*
Q3. Do you usually return to course material to review it after a course has ended?	Yes No	10/52 (19.2) 42/52 (80.8)	37/82 (45.1) 45/82 (54.9)	0.002

Key for Table: *Chi-squared test, #Fisher's exact test.

Study Strategies regularly used

	Number of responses (percentage) for students in Spain	Number of responses (percentage) for students in UK	p value
Recopy your notes	**22/51 (43.1)**	**51/82 (62.2)**	0.032

Study Strategies regularly used

	Number of responses (percentage) for students in Spain	Number of responses (percentage) for students in UK	p value
Recopy your notes	**22/51 (43.1)**	**51/82 (62.2)**	0.032
Reread chapters, articles, notes, etc	**30/51 (58.8)**	**41/82 (50.0)**	0.031

Study Strategies regularly used

	Number of responses (percentage) for students in Spain	Number of responses (percentage) for students in UK	p value
Recopy your notes	**22/51 (43.1)**	**51/82 (62.2)**	0.032
Reread chapters, articles, notes, etc	**30/51 (58.8)**	**41/82 (50.0)**	0.031
“Cram” lots of information the night before the test	**9/51 (17.6)**	**33/82 (40.2)**	0.006

Study Strategies regularly used

	Number of responses (percentage) for students in Spain	Number of responses (percentage) for students in UK	p value
Make diagrams, charts, or pictures	**5/51 (9.8)**	**40/82 (48.8)**	<0.001

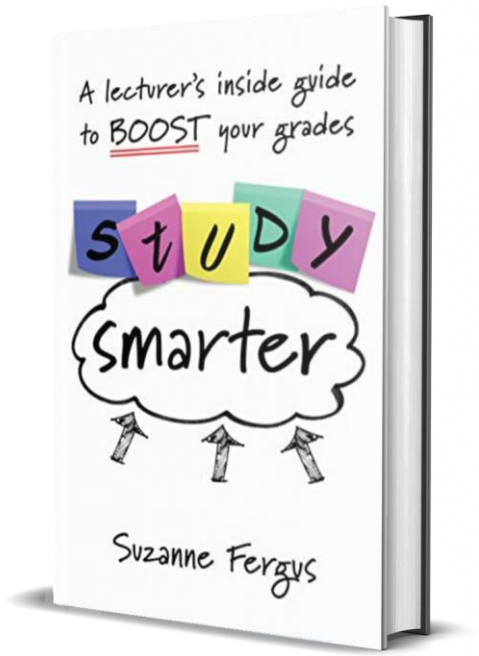
Study Strategies regularly used

	Number of responses (percentage) for students in Spain	Number of responses (percentage) for students in UK	p value
Make diagrams, charts, or pictures	**5/51 (9.8)**	**40/82 (48.8)**	<0.001
Ask questions or verbally participate during class	**7/51 (13.7)**	**13/82 (15.9)**	0.738

Study Strategies regularly used

	Number of responses (percentage) for students in Spain	Number of responses (percentage) for students in UK	p value
Make diagrams, charts, or pictures	**5/51 (9.8)**	**40/82 (48.8)**	<0.001
Ask questions or verbally participate during class	**7/51 (13.7)**	**13/82 (15.9)**	0.738
Test yourself with questions or practice problems	**32/51 (62.7)**	**52/82 (63.4)**	0.938

Implications of findings



For Students

Training on metacognitive awareness and evidence-based study strategies

For Instructors

Debunk education myths e.g learning styles

Increased metacognitive awareness to include within teaching

Thank you!
Any questions?

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