

How are they supposed to remember all that?!

A session on what Cognitive Science research can tell us about memory – and how we can apply this to MFL teaching, especially in light of demanding GCSE specifications.



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www.learninglinguist.co.uk

If you have a phone, tablet or other device with you then you may want to have it to hand. I will be using Mentimeter to collect responses from you during the session.

Who am I?



- ▶ Head of Spanish at The Boswells School, Chelmsford, Essex
- ▶ Founder and regular host of Twitter #MFLChat
- ▶ Council member of the Chartered College of Teaching
- ▶ Recently completed the Chartered Teacher pilot
- ▶ Passionate about the application of research findings in the classroom
- ▶ Wannabe edu-nerd

Session aims

- ▶ Understand the key learning strategies recommended by cognitive science.
- ▶ Consider how we are already applying these in the classroom.
- ▶ Discuss ways in which we can clearly plan lessons and lesson sequences with these in mind.



Key Question



Memory is the
residue of thought.

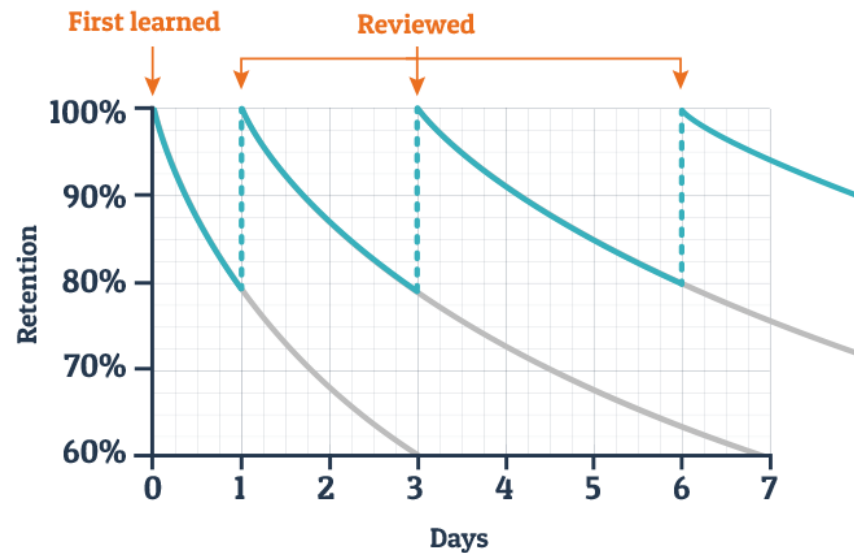
Willingham (2010)

Sound familiar?



- ▶ 'we did this last lesson!'
- ▶ 'you should remember this from year 7'
- ▶ 'Why don't they remember anything I teach them?!'

Typical Forgetting Curve for Newly Learned Information



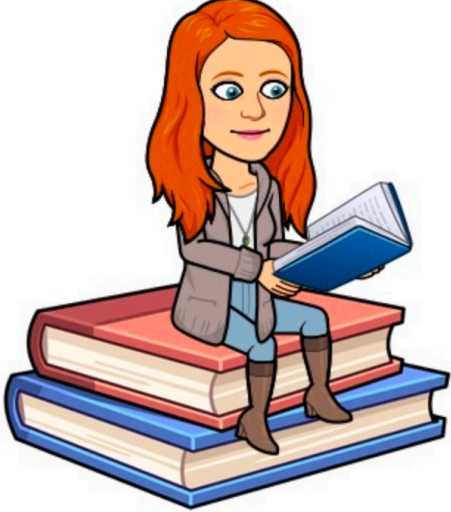
Warning

What is the challenge here?



- ▶ Timetabling – both the allocation of hours and when these fall on the timetable.
- ▶ Amount of 'content to be covered'.
- ▶ Vocabulary and grammar knowledge needed for top GCSE grades.
- ▶ Homework policies
- ▶ Overcoming the reputation of being a hard subject to do well in.

Effective study strategies

[illegible]

Study Strategies to Boost Learning



Strengthening the Student Toolbox

Study Strategies to Boost Learning



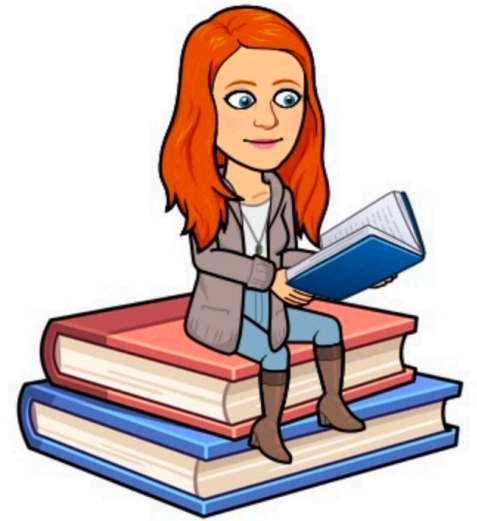
Table 1

Effectiveness of Techniques Reviewed

Technique	Extent and Conditions of Effectiveness
Practice testing	Very effective under a wide array of situations
Distributed practice	Very effective under a wide array of situations
Interleaved practice	Promising for math and concept learning, but needs more research
Elaborative interrogation	Promising, but needs more research
Self-explanation	Promising, but needs more research
Rereading	Distributed rereading can be helpful, but time could be better spent using another strategy
Highlighting and underlining	Not particularly helpful, but can be used as a first step toward further study
Summarization	Helpful only with training on how to summarize
Keyword mnemonic	Somewhat helpful for learning languages, but benefits are short-lived
Imagery for text	Benefits limited to imagery-friendly text, and needs more research

Making Things Hard on Yourself, But in a Good Way: Creating Desirable Difficulties to Enhance Learning

Elizabeth Ligon Bjork and Robert A. Bjork
University of California, Los Angeles



The basic problem learners confront is that we can easily be misled as to whether we are learning effectively and have or have not achieved a level of learning and comprehension that will support our subsequent access to information or skills we are trying to learn. We can be misled by our subjective impressions. Rereading a chapter a second time, for example, can provide a sense of familiarity or perceptual fluency that we interpret as understanding or comprehension, but may actually be a product of low-level perceptual priming. Similarly, information coming readily to mind can be interpreted as evidence of learning, but could instead be a product of cues that are present in the study situation, but that are unlikely to be present at a later time. We can also be misled by our current performance. Conditions of learning that make performance improve rapidly often fail to support long-term retention and transfer, whereas conditions that create challenges and slow the rate of apparent learning often optimize long-term retention and transfer.



Six Strategies for Effective Learning

LEARNINGSIENTISTS.ORG

All of these strategies have supporting evidence from cognitive psychology. For each strategy, we explain how to do it, some points to consider, and where to find more information.



Retrieval



‘the process of getting something back from somewhere’

Do Now

- 1) How many of the...
- 2) Which is the odd...
- 3) Conjugate
- 4) Translate

CONNECT THE RECALL

Your task
Translate 10 words
connecting
counters of
same colour
Yellow = Medium
Red = Difficult

What's the longest chain of any colour that you can make?

Une

One Mad Minute!

1 point – words from yesterday

Aller : je _____

Avoir : tu _____

Être

Faire

Ver

Pou

Ve

Sa

Fir

Air

Ve

M

Pa

Co

Dir

VOCAB CHASE

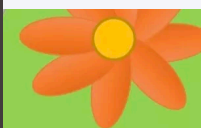
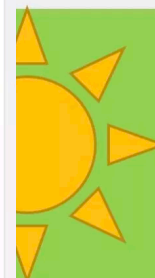
Use correctly in a sentence

Give an explanation/definition

Follow the instructions

4 points – words from last term

TOPIC?





Which of these is a correct translation of 'the red shoes'

- a) Los zapatos rojo
- b) Los zapatos roja
- c) Los zapatos rojas
- d) Los zapatos rojos

Which of these is a correct translation of 'the red shoes'

- a) El vestido azul
- b) Los zapatos rojos
- c) Las zapatillas rojas
- d) La gorra amarilla

Spacing

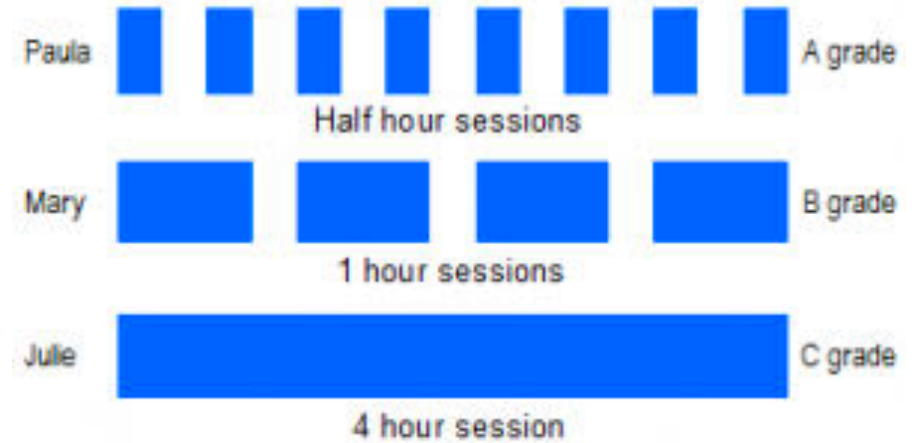
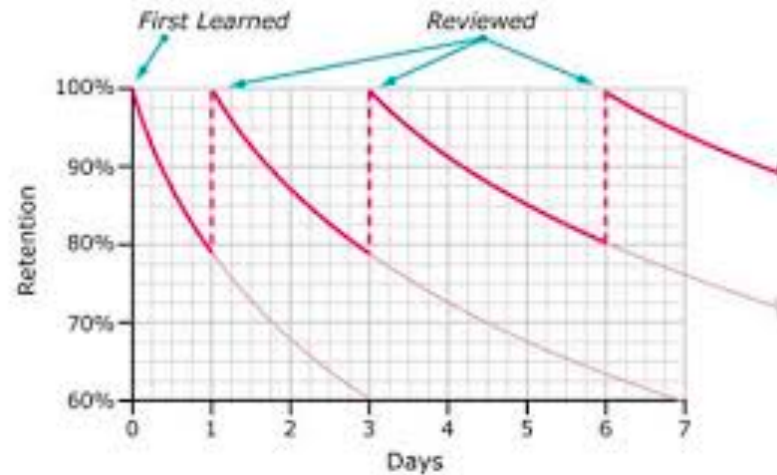


3.5 hrs total

9	10	11	12	13	14	15
30 min	30 min		30 min		30 min	
16	17	18	19	20	21	22
	30 min			30 min	30 min	TEST

S-P-A-C-E-D Practice

Typical Forgetting Curve for Newly Learned Information



Lesson	1	2	3	4	5	6
11D lessons	06-Feb	07-Feb	08-Feb	13-Feb	14-Feb	15-Feb
Other info						
Retrieval topic (Starter test)	Module 3	Module 7	Module 6	Module 4	Module 1	Module 8
Grammar	Present - irregulars	Future	Reflexives - present	Imperfect	Preterite	Future
Skill(s)	Reading	Listening	Translation	Reading	Listening	Translation
	Speaking/ writing - Picture	Writing	Writing	Speaking - Roleplay	Writing	Writing
Topics	Module 6	Module 2	Module 3	Module 6	Module 5	Module 1
	Module 4	Module 7	Module 4	Module 3	Module 8	Module 5
Homework topic (Quizlet chunk sets made by RNS)	Module 4			Module 1		

An investigation into the effect of desirable difficulties, such as retrieval practice and spacing, on GCSE Spanish students' memory for key vocabulary and structures.

Does the implementation of retrieval practice and spacing into lessons and homework have a positive effect on year 11 student retention of vocabulary and grammatical structures, and therefore outcomes at GCSE level?

Introduction

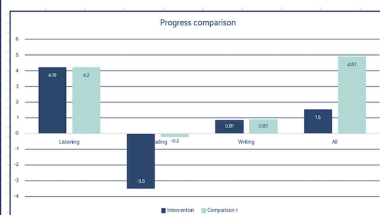
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- Cognitive psychology can support teachers to support their students.
- Desirable difficulties show that what students find easy doesn't necessarily have the greatest benefits to their learning (Bjork, 1994, Bjork, Dunlosky and Kornell, 2013)
- This project aims to determine if applying these principles has a positive impact for GCSE Spanish.
- Results from this investigation could lead to changes being made to both GCSE and Key Stage Three Spanish schemes of learning in order to embrace desirable difficulties.

Abstract

This study investigated the effect of retrieval practice and spacing on students' vocabulary knowledge using exam data and surveys to draw conclusions. It has shown potential positive effects of spaced practice and retrieval practice on students' memory and therefore progress in GCSE Spanish, especially amongst the most motivated and hardworking students. Further research with students of different ages and adapted retrieval tasks is now required.

Methodology

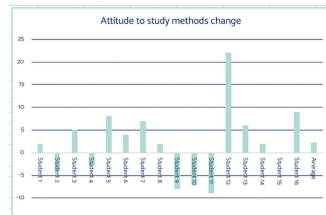
- One year eleven class were chosen to take part in the study. They answered a survey at the beginning and end of the intervention and their responses along with two sets of mock GCSE results were analysed to produce the results and discussion below.
- The intervention involved discussing memory with students and then setting homework and starter activities which encouraged spacing and retrieval.
- All necessary permissions were sought in line with the relevant ethical guidelines.
- Limitations such as lack of direct comparison group and the use of mock GCSE results have been considered when drawing conclusions in the following discussion.



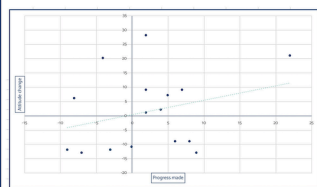
The graph above shows the progress made by the intervention group, compared to that of another group. It can be seen that progress was made in all areas but the reading exam. This was the same for both groups, with the intervention group making on average less progress than the comparison.

Results

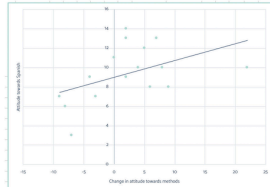
Spanish
vocabulary
memory
learning
cognitive
change
survey
data
analysis
attitude
study
structures
spacing
retrieval
testing



The graph above shows the change in students' attitudes towards their study methods, including self-testing and spaced practice. It shows that more students experienced a positive change than a negative one.



The graph to the left plots the change in student attitude towards study methods against the progress they made in the exams. To the right, student attitudes towards Spanish are plotted against any change in their attitude towards the study methods suggested to them as part of the intervention. Whilst neither graph can be said to show a conclusive link, they would suggest that students with more positive attitudes towards Spanish were more likely to feel positively about the methods and then more likely to make progress.



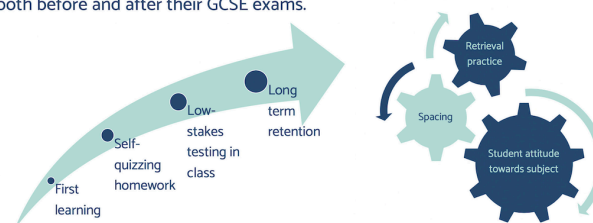
In addition to the graphs shown, students scores on regular low-stakes tests in class rose on average by three marks from the first test to the last.

Discussion

Whilst this study is unable to reach definitive conclusions about the effect of retrieval practice and spacing on performance at GCSE level Spanish, a number of inferences can be made:

- Students who are regularly tested on certain structures and vocabulary will perform better over time on tests which specifically target the same content.
- Students that show a more positive attitude towards a subject are more likely to engage with an intervention and be open to new study methods and ideas.

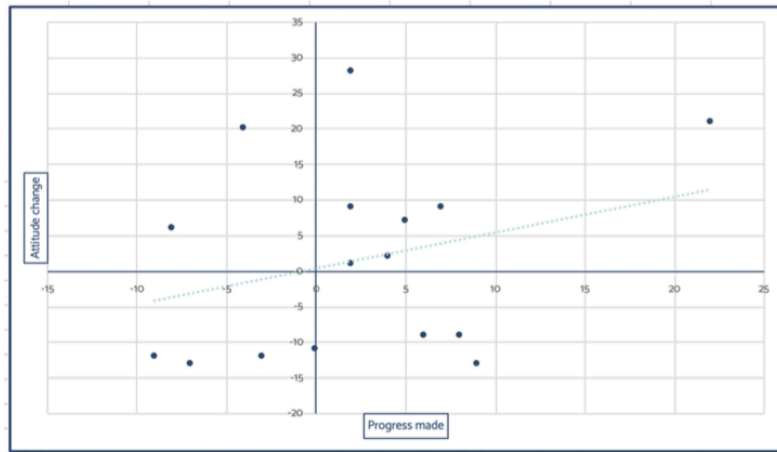
Further research should be targeted at younger students, to embed vocabulary and structures before GCSE. Additionally, establishing spacing and retrieval as part of good language learning skills from early on should help to support students both before and after their GCSE exams.



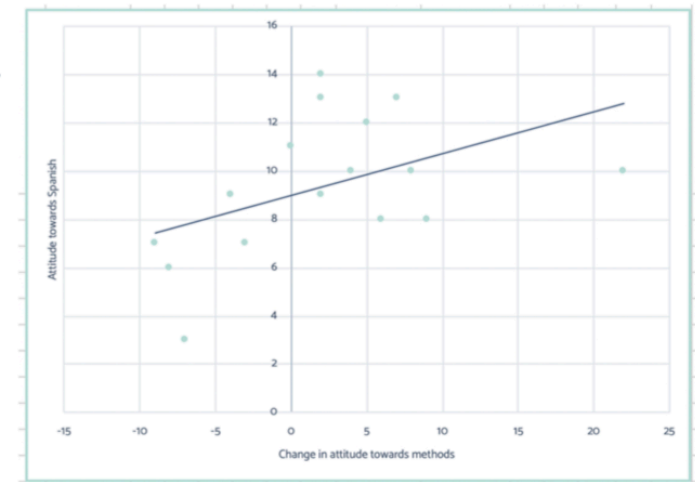
Rebecca Ann Nobes - March 2019



Poster submitted
as part of the
assessment for
Chartered Teacher
Status – March
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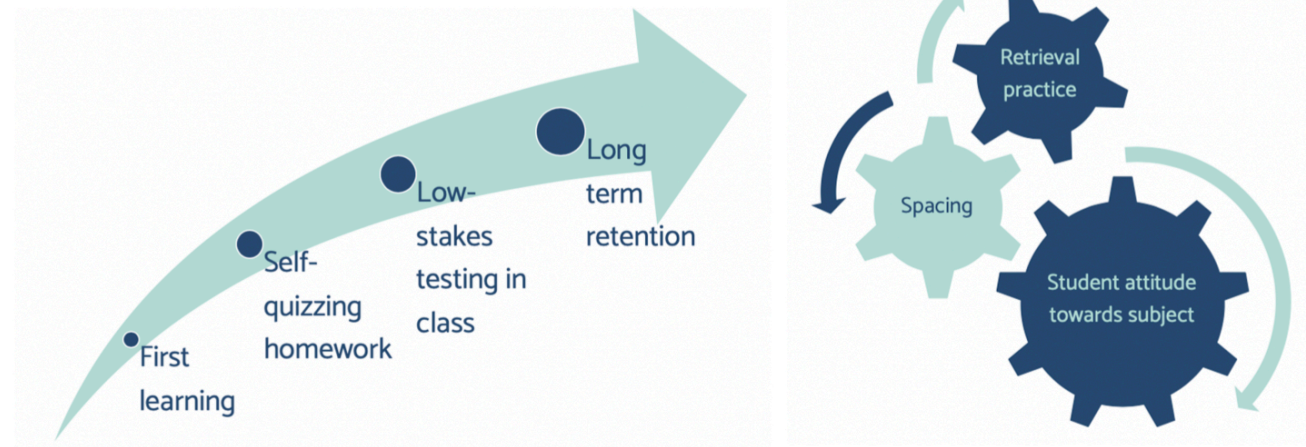


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Interleaving



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LEARN TO STUDY USING...

Interleaving

SWITCH BETWEEN IDEAS WHILE YOU STUDY



HOW TO DO IT

Switch between ideas during a study session. Don't study one idea for too long.



Go back over the ideas again in different orders to strengthen your understanding.

TOPICS
A B C



STUDY
SESSION
1

TOPICS
C B A



STUDY
SESSION
2

TOPICS
A C B



STUDY
SESSION
3

Make links between different ideas as you switch between them.



HOLD ON!



While it's good to switch between ideas, don't switch too often, or spend too little time on any one idea; you need to make sure you understand them.



Interleaving will feel harder than studying the same thing for a long time. But don't worry - this is actually helpful to your learning!

RESEARCH

Read more about
interleaving
as a study strategy

Rohrer, D. (2012). Interleaving helps students distinguish among similar concepts. *Educational Psychology Review*, 24, 355-367.

THE PRINCIPLES OF INSTRUCTION

TAKEN FROM THE INTERNATIONAL ACADEMY OF EDUCATION

This poster is from the work of Barak Rosenshine who based these ten principles of instruction and suggested classroom practices on:

- research on how the brain acquires and uses new information
- research on the classroom practices of those teachers whose students show the highest gains
- findings from studies that taught learning strategies to students.

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HOW2
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01 DAILY REVIEW



Daily review is an important component of instruction. It helps strengthen the connections of the material learned. Automatic recall frees working memory for problem solving and creativity.

02 NEW MATERIAL IN SMALL STEPS



Our working memory is small, only handling a few bits of information at once. Avoid its overload — present new material in small steps and proceed only when first steps are mastered.

03 ASK QUESTIONS



The most successful teachers spend more than half the class time lecturing, demonstrating and asking questions. Questions allow the teacher to determine how well the material is learned.

04 PROVIDE MODELS



Students need cognitive support to help them learn how to solve problems. Modelling, worked examples and teacher thinking out loud help clarify the specific steps involved.

05 GUIDE STUDENT PRACTICE



Students need additional time to rephrase, elaborate and summarise new material in order to store it in their long-term memory. More successful teachers built in more time for this.

06 CHECK STUDENT UNDERSTANDING



Less successful teachers merely ask "Are there any questions?" No questions are taken to mean no problems. False. By contrast, more successful teachers check on all students.

07 OBTAIN HIGH SUCCESS RATE



A success rate of around 80% has been found to be optimal, showing students are learning and also being challenged. Better teachers taught in small steps followed by practice.

08 SCAFFOLDS FOR DIFFICULT TASKS



Scaffolds are temporary supports to assist learning. They can include modelling, teacher thinking aloud, cue cards and checklists. Scaffolds are part of cognitive apprenticeship.

09 INDEPENDENT PRACTICE



Independent practice produces 'overlearning' — a necessary process for new material to be recalled automatically. This ensures no overloading of students' working memory.

10 WEEKLY & MONTHLY REVIEW



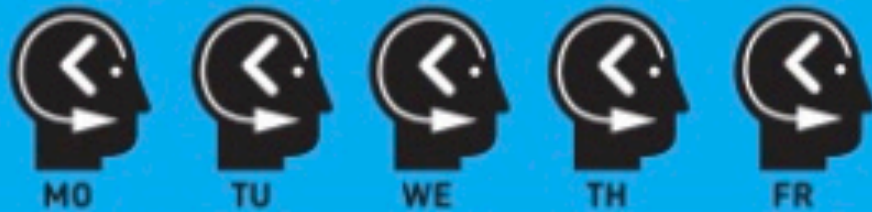
The effort involved in recalling recently-learned material embeds it in long-term memory. And the more this happens, the easier it is to connect new material to such prior knowledge.

SEE YOU IN CLASS



■ findings from studies that taught learning strat

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teachinghow2s.com

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Quizlet

socrative
by MasteryConnect

QUIZZZ

Gimkit

Kahoot!

plickers
clickers, simplified

04 PROVIDE MODELS



Students need cognitive support to help them learn how to solve problems. Modelling, worked examples and teacher thinking out loud help clarify the specific steps involved.

¡Hola! Me llamo Pablo y vivo en	Hello! My name is Pablo and I live in
Bournemouth, está en el sur de	Bournemouth, it's in the south of
Inglaterra en la costa lo que es	England on the coast which is
muy bonita y siempre hace buen tiempo .	really pretty and it's always nice weather .
Vivo con mi familia en una casa adosada	I live with my family in a terraced house
en las afueras .	in the suburbs .
Hay un jardín, un garaje y una cocina	There's a garden, a garage and a modern
moderna en mi casa pero mi	kitchen in my house but my
dormitorio es mi sala preferida porque	bedroom is my favourite room because
tengo todos mis libros y música allí .	I have all my books and music there .
Me chifla mi barrio porque	I really love my neighbourhood because
hay mucho para los habitantes.	there's a lot for the residents.
Lo bueno de mi barrio es que	The good thing about my area is that
se puede hacer muchas actividades,	you can do lots of activities,
sin embargo lo malo de mi barrio es que	however the bad thing about my area is that
no se puede esquiar	you can't ski in winter
porque no hay montañas aquí.	because there are no mountains here.

Credit
@MissNewnham

05 GUIDE STUDENT PRACTICE



Students need additional time to rephrase, elaborate and summarise new material in order to store it in their long-term

Modelling

Use the writing frame below to translate the sentences into Spanish.

Hay <i>There is/are</i>	un centro comercial		
	una piscina <i>pool</i>		
	unos cafés		
	unos museos		
No hay <i>There isn't/aren't</i>	banco		
	tiendas		
	polideportivo		
	parque		
Hay ni....ni... <i>There's neither...</i>	pista de hielo <i>ice rink</i>	...ni.... <i>...nor...</i>	biblioteca <i>library</i>
	cine <i>cinema</i>		pastelería <i>cake shop</i>
	playa <i>beach</i>		panadería <i>bakery</i>
	restaurantes		carnicería <i>butcher's</i>

1. There is a pool, some museums and some cafés.

2. There aren't any shops.

3. There is no bank.

4. There's neither an ice rink nor a bakery.

5. There is a shopping centre but there is no park.

Deliberate Practice

Now, use the writing frame to translate this paragraph into Spanish independently.

Hay <i>There is/are</i>	un centro comercial		
	una piscina <i>pool</i>		
	unos cafés		
	unos museos		
No hay <i>There isn't/aren't</i>	banco		
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I like Barcelona because there are lots of museums, churches and parks. However, there aren't many shops or banks. There's neither a cinema nor a sports centre, which is sad. I would like to visit Barcelona because there is a famous park.

Complete the exam style question with the help of the structure strip and your Knowledge Organiser.

Escribes un blog sobre donde vives.

Mencionas:

- Donde vives
- Tu casa
- Tu barrio
- Dónde te gustaría vivir

Where do you live?

- Vivo en...
- ...con...
- ..en un...
- Me gusta/no me gusta

What is your house like?

- Me gusta/no me gusta
- Hay
- Mi sala favorita es..
- Porque hay...

What's in your town?

- En mi pueblo hay...
- Me interesa...
- Odio ...
- El fin de semana

Where do you want to live in the future?

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90-word task

PASO 1: Translate the task into English.

Escribe una carta a tu amiga mexicana sobre tus vacaciones.

Menciona:

- Dónde vives
- Adónde fuiste de vacaciones el año pasado
- Tu opinión sobre las vacaciones
- Tus planes para el próximo verano

Escribe aproximadamente 90 palabras

PASO 2:

Turn each bullet point into the 'I' form and identify the tense.

- Dónde vives _____
- Adónde fuiste de vacaciones el año pasado _____
- Tu opinión sobre las vacaciones _____
- Tus planes para el próximo verano _____

PASO 3:

Write down the endings of the present, preterite and future

PRESENT			PRETERITE	
ar	er	ir	ar	er/ir
I				
you sg.				
he/she/it				
we				
you pl.				
they				
FUTURE				
I				
you sg.				
he/she/it				
we				
you pl.				
they				

PASO 4: FILL IN YOUR LOTS LIST

LINKING WORDS

OPINIONS

TIME FRAMES

STRUCTURES

USEFUL VOCABULARY

Credit @senorcordero

FINAL CHECKLIST

HAVE YOU:

1. Checked you have met all bullet points? []
2. Checked your verb endings? []
3. Included at least 2 opinions? []
4. Made sure your work makes sense?
5. Included all three time frames? Past [] Present [] Future []

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Independent practice produces 'overlearning' — a necessary process for new material to be recalled automatically. This ensures no overloading of students' working memory.

PASO 5: Write your essay

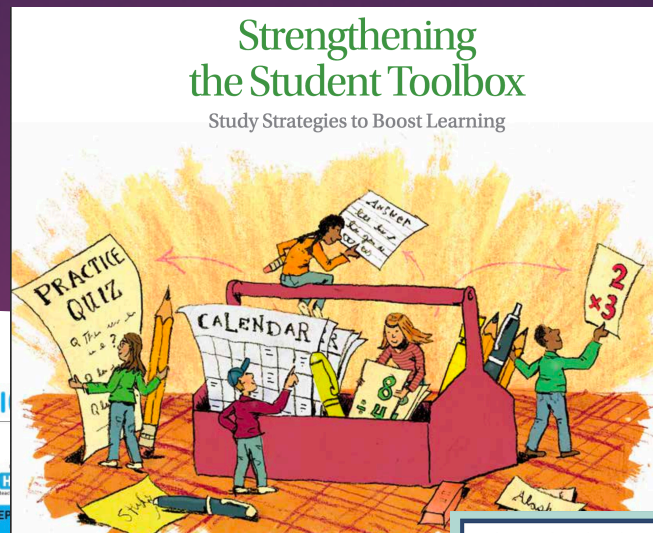
- **Dónde vives**
- **Adónde fuiste de vacaciones el año pasado**
- **Tu opinión sobre las vacaciones**
- **Tus planes para el próximo verano**

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

Related reading



- ▶ Bjork – Coined the term desirable difficulties
 - ▶ Dunlosky – Strengthening the Student Toolbox
 - ▶ Rosenshine – Principles of Instruction
 - ▶ Sweller – Cognitive Load Theory
 - ▶ Wilingham – Why don't students like school?
-
- ▶ The Learning Scientists - <http://www.learningscientists.org/> - podcast, videos, blogs and book Understanding How We Learn



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Methodology

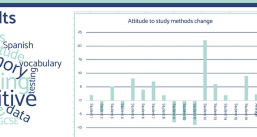
- One year eleven class were chosen to take part in the study. They answered a survey at the beginning and end of the intervention and their responses along with two sets of mock GCSE results were analysed to produce the results and discussion below.
- The intervention involved discussing memory with students and then setting homework and starter activities which encouraged spacing and retrieval.
- All necessary permissions were sought in line with the relevant ethical guidelines.
- Limitations such as lack of direct comparison group and the use of mock GCSE results have been considered when drawing conclusions in the following discussion.



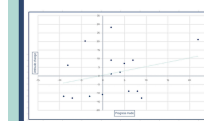
The graph above shows the progress made by the intervention group, compared to that of another group. It can be seen that progress was made in all areas but the reading exam. This was the same for both groups, with the intervention group making on average less progress than the comparison.

Results

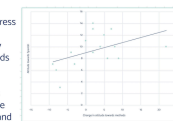
analysis results memory study learning cognitive change data



The graph above shows the change in students' attitudes towards their study methods, including self-testing and spaced practice. It shows that more students experienced a positive change than a negative one.



The graph to the left plots the change in student attitude towards study methods against the progress they made in the exams. To the right, student attitudes towards Spanish are plotted against any change in their attitude towards the study methods suggested to them as part of the intervention. Whilst neither graph can be said to show a conclusive link, they would suggest that students with more positive attitudes towards Spanish were more likely to feel positively about the methods and then more likely to make progress.



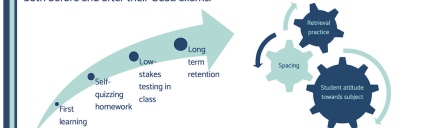
In addition to the graphs shown, students scores on regular low-stakes tests in class rose on average by three marks from the first test to the last.

Discussion

Whilst this study is unable to reach definitive conclusions about the effect of retrieval practice and spacing on performance at GCSE level Spanish, a number of inferences can be made:

- Students who are regularly tested on certain structures and vocabulary will perform better over time on tests which specifically target the same content.
- Students that show a more positive attitude towards a subject are more likely to engage with an intervention and be open to new study methods and ideas.

Further research should be targeted at younger students, to embed vocabulary and structures before GCSE. Additionally, establishing spacing and retrieval as part of good language learning skills from early on should help to support students both before and after their GCSE exams.



Rebecca Ann Nobes - March 2019



How are they supposed to
remember all that?!

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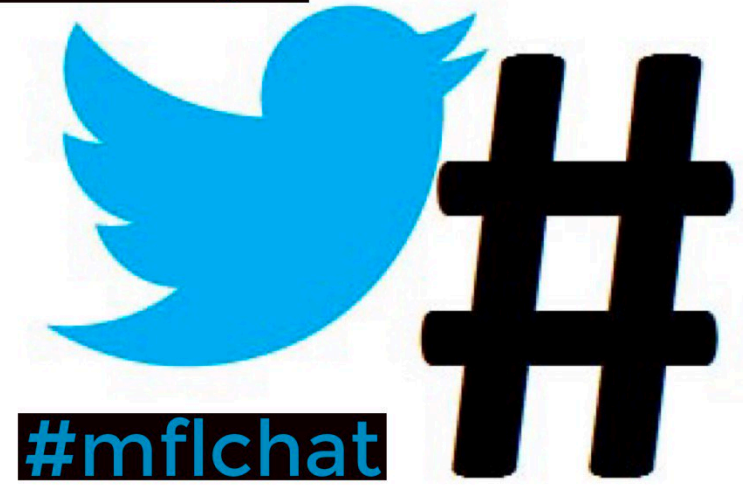
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