Does spacing homework improve learning in a team-based learning course?

UNC ESHELMAN SCHOOL OF PHARMACY

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KEY POINTS

1. This is the first study examining the impact of spacing of homework in an active learning classroom
2. Spaced homework (problems spaced over time) did not increase performance on a short retention interval, low-stakes assessment compared to massed homework (problems completed all at once)
3. Detecting spacing effects of homework may be difficult in an active learning course
4. Spacing effects may be better detected with longer term measures of learning performance

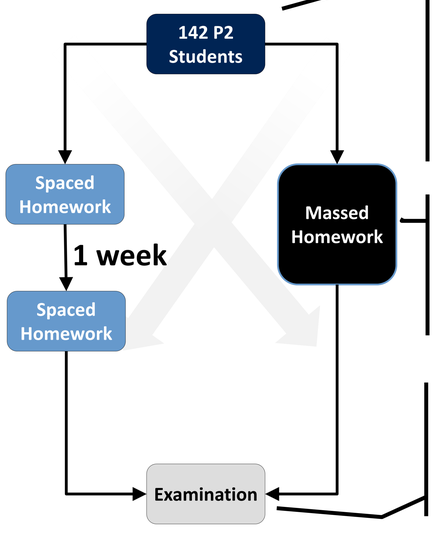
Why did we do this study?

- In laboratory settings, spacing of practice problems results in stronger and longer retention of material compared to massing of practice [1]
- There is little research of the impact of spacing of practice problems versus massing of practice problems in an authentic classroom situation that uses active learning [2]

What did we do?

Overview of Study Design

See Figure 1 for details



Students with complete data sets within Pharmacokinetics (2nd year, Fall semester)

Randomly divided into 2 groups in a blocked design so both groups received spaced and massed homework

Homework completed via an adaptive learning technology (OpenStax, Rice Univ.). 3 spaced assignments; 3 massed assignments

44 multiple choice question (4 questions per topic), low stakes assessment completed through the learning management system (Sakai)

What did we find?

TABLE 1
Examination performance by spacing condition. Presented as mean (SD)

Examination questions that were practiced as…	Proportion Correct (n = 142)
Spaced	.82 (.23)
Massed	.81 (.22)

No significant effects, paired t-test

TABLE 2
Initial learning based on homework performance and spacing condition. Presented as mean (SD)

	A: First Set	B: Second Set
Spaced	.67 (.25)	.66 (.25)
Massed	.66 (.26)	.65 (.28)

No significant effects

TABLE 3
Final test conditionalized on homework 1 performance (median split). Presented as mean (SD). High: Above Median; Low: Below Median

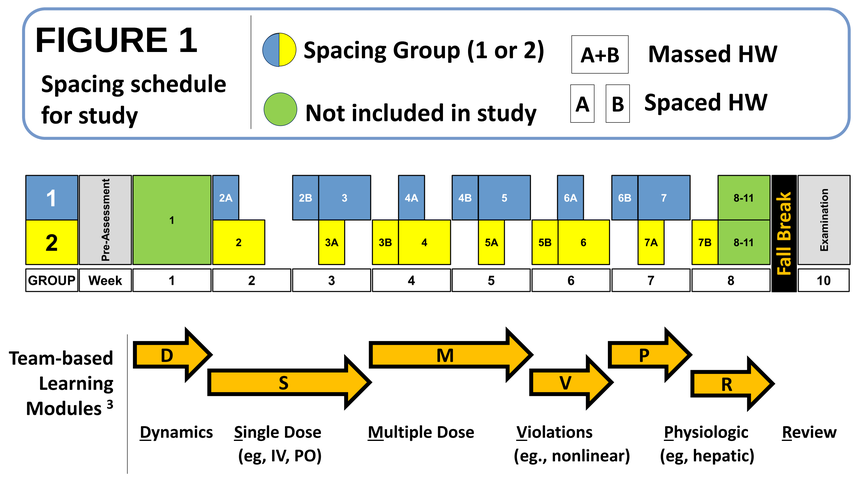
	HW 1 High	HW 1 Low
Spaced	.89 (.12)	.76 (.20)
Massed	.86 (.11)	.77 (.18)

No significant effects

What does this mean?

- Spacing of homework assignments did not result in better examination performance compared to massing of homework (Table 1)
- Performance on homework assignments was not different between the spaced and massed condition (Table 2)
- No difference in examination performance when conditionalized for high and low homework performers (Table 3)

FIGURE 1
Spacing schedule for study



Why didn't this work?

The spacing effect was not verified in this study potentially for several reasons:

1. The course format (team-based learning) swamps out the spacing effects because of the cumulative nature of the format or course (active learning effects)
2. The post-assessment was not delayed enough to see an effect. Longer delays may be needed (delay effects).
3. Acute studying prior to the assessment (cramming/massed practice), results in acute higher performance (re-study effects)
4. Students knew spacing practice was better and did it on their own outside of formal class assignment (contagion effect) [4]
5. There was similarity in content or skills between homework sets (eg, infusion to steady-state vs infusion not to steady-state) (transfer effects)

References

1. Dempster FN (1989), Educational Psychology Reviews, 1(4):309-330
2. Kapler, IV et al (2015) Learning & Instruction, 36 (April):38-45
3. Persky, AM et al (2015) American Journal of Pharmaceutical Education. 79(2): Article 20
4. Powers JT et al (2015) Psychological Science, 27(2):150-160

This work was completed in collaboration with Elizabeth Marsh, PhD and Allison Cantor, PhD candidate (Duke University Department of Psychology and Neuroscience and Andrew Butler, PhD, University of Texas Department of Educational Psychology. This study was approved by the Institutional Review Board of the University of North Carolina at Chapel Hill

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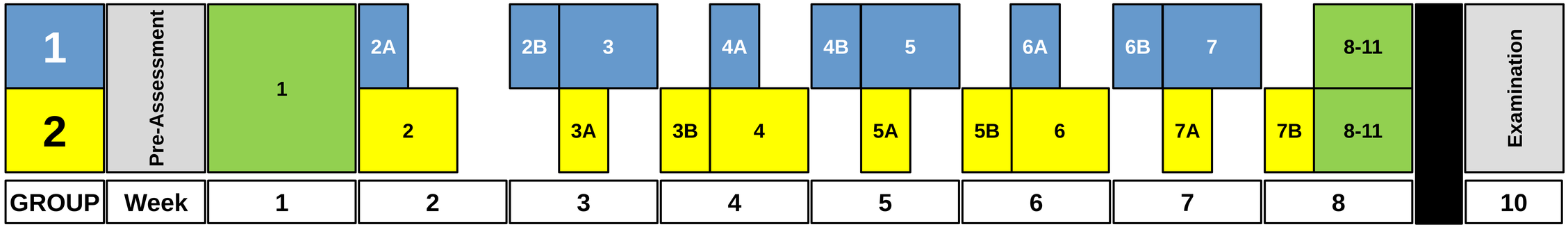
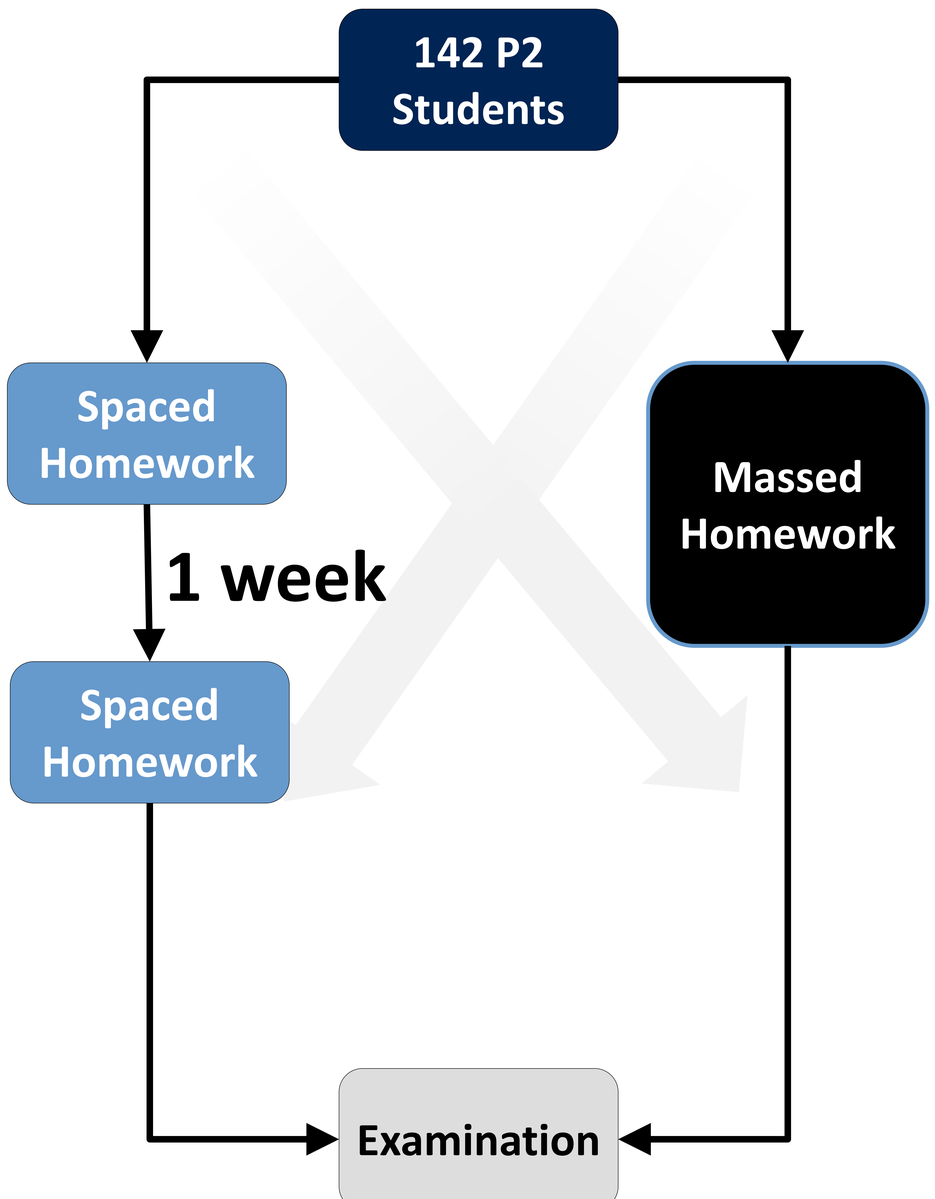
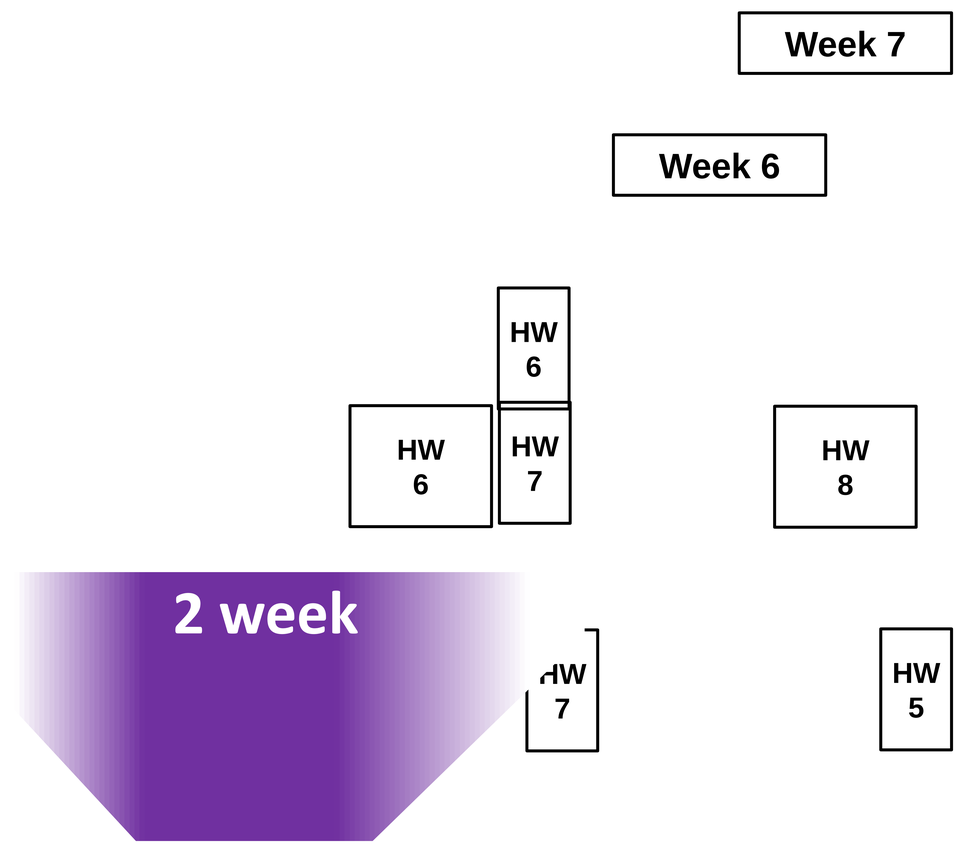

1
2
Pre-Assessment
1
2A
2
2B
3
3A
3B
4A
4
4B
5
5A
5B
6A
6
6B
7
7A
7B
8-11
8-11
Examination
GROUP
Week
1
2
3
4
5
6
7
8
10


142 P2 Students
Spaced Homework
1 week
Spaced Homework
Massed Homework
Examination


Week 7
Week 6
HW 6
HW 6
HW 7
HW 8
2 week
HW 7
HW 5