Encourage students to reflect on current
And prior lectures with minitests
My course

First year course with 60 students
Studies
Physics and technology, power electronics and electronics
Six Strategies for Effective Learning

LEARN TO STUDY USING...
Spaced Practice
SPACE OUT YOUR STUDYING OVER TIME

HOW TO DO IT

Start planning early for exams, and set aside a little bit of time every day. Five hours spread out over two weeks is better than the same five hours all at once.

Review information from each class, but not immediately after class.

After you review information from the most recent class, make sure to go back and study important older information to keep it fresh.

HOLD ON!

When you sit down to study, make sure you are using effective study strategies rather than just re-reading your class notes.

This may seem difficult and you may forget some information from day to day, but this is actually a good thing! This forces you to retrieve information from memory (see Retrieval Practice poster).

Create small spaces (a few days) and do a little bit over time, so that it adds up!

RESEARCH

**Six Strategies for Effective Learning**

**LEARN TO STUDY USING...**

**Spaced Practice**
SPACE OUT YOUR STUDYING OVER TIME

**HOW TO**

Start planning early for each set aside a little bit of time. Five hours spread over weeks is better than the hours all at once.

Review information from class, but not immediate class.

After you review information from the most recent class, go back and study some older information to keep it fresh in your mind.

**LEARN TO STUDY USING...**

** Retrieval Practice**
PRACTICE BRINGING INFORMATION TO MIND

**HOW TO DO IT**

Put away your class materials, and write or sketch everything you know. Be as thorough as possible. Then, check your class materials for accuracy and important points you missed.

Take as many practice tests as you can to get your hands on. If you don’t have ready-made tests, try making your own and trading with a friend who has done the same.

You can also make flashcards. Just make sure you practice recalling the information on them, and go beyond definitions by thinking of links between ideas.

**HOW ON**

Retrieval practice works best when you go back to check your class materials for accuracy afterward.

Retrieval is hard! If you’re struggling, identify the things you’ve missed from your class materials, and work your way up to recalling it on your own with the class materials closed.

Don’t only recall words and definitions. Make sure to recall main ideas, how things are related or different from one another, and new examples.
Six Strategies for Effective Learning

LEARN TO STUDY USING...

Spaced Practice
SPACE OUT YOUR STUDYING OVER TIME

HOLD
TESTING SPACING GUESS

How To
Start planning early for a set aside a little bit of time day. Five hours spread over weeks is better than the hours all at once.

Retrieve Practice
RETRIEVAL PRACTICE BRINGING INFORMATION TO MIND

HOLD
TESTING SPACING GUESS

How To
Put away your class notes or sketch every day. Be as thorough. Then, check your class notes. Accuracy and importance missed.

Elaboration
ELABORATION EXPLAIN AND DESCRIBE IDEAS WITH MANY DETAILS

HOLD
TESTING SPACING GUESS

How To
Ask yourself questions while you are studying about how things work and why, and then find the answers in your class materials and discuss them with your classmates.

Concrete Examples
USE SPECIFIC EXAMPLES TO UNDERSTAND ABSTRACT IDEAS

Elaboration
Elaboration

HOLD
TESTING SPACING GUESS

How To
Describe how ideas you are studying apply to your own experiences or memories. As you go through your day, make connections to the ideas you are learning in class.

Switch between ideas while you study

Content by Tanya Wernikoff (University of Massachusetts Amherst & Morgan Smith) Funding provided by the APS Fund for Teaching

DU
Fall 2016

- Free recall on today's lecture
- Calculation exercise based on prior lecture
  - Type of exercise was announced in advance
Free recall fra dagens forelæsning

Beregningsopgave
Beregningsopgave

\[ I = \int 3x^2 \sin(x^3) \, dx \]

Vi starter med at finde en \( u' \)

\[ u = 3x^2 \Rightarrow u' = 6x = \frac{du}{dx} = 6x \]

\[ I = \int \sin(x^3) \cdot 6x \, dx \]

Differentierer vi \( \sin(3v) = \sin(x^3) \)

\[ v = \cos(u) / 6x \]

\[ = -\cos(u) / 3x \]

\[ = -\cos(3v) / 3x \]

\[ u \in \mathbb{R} \]

\[ v = \frac{x^3}{3} \]

\[ 3x^2 \]
The grading process

- Red pen marking (90 min)
- Scan all pages (5 min)
- Analyse images (10 min)
- Results by email (10 min)
- Free recall (score)
- Calculation (strategy, explanations, calculations)
Comments from students

- Some students "zoomed out" just prior to the minitest.
Fall 2017

- Free recall on *prior* lecture
- Calculation exercise based on prior lecture
  - Type of exercise was announced in advance
  - Worked examples was provided online
Comments from students

- The minitest "forces" you to recap the material.
- Minitest in class about the previous subject. Gives an indication on how well the subject was understood.
Student estimated effect of teaching elements

- Weekly notes: 94%
- Videos: 90%
- Online exercises: 85%
- Lectures: 85%
- Exercises in class: 60%
- Work with exercise sheets: 60%

Minitests: 85%
Practical issues

• Handing out minitests
  – Ordered by first name

• Getting minitests back
  – Students continue writing on the test after the time has run out

• Chatting after the minitest
  – It has become very difficult to make the class quiet after the minitests.
Reflections

• Costs
  ‒ Class time (15 min per minitest)
  ‒ Grading time (120 min per minitest)

• Benefits
  ‒ Detailed insight into the students current level in the course
  ‒ Demonstrating effective study strategies for the students
Questions

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