the flipped classroom : a fresh look at teaching

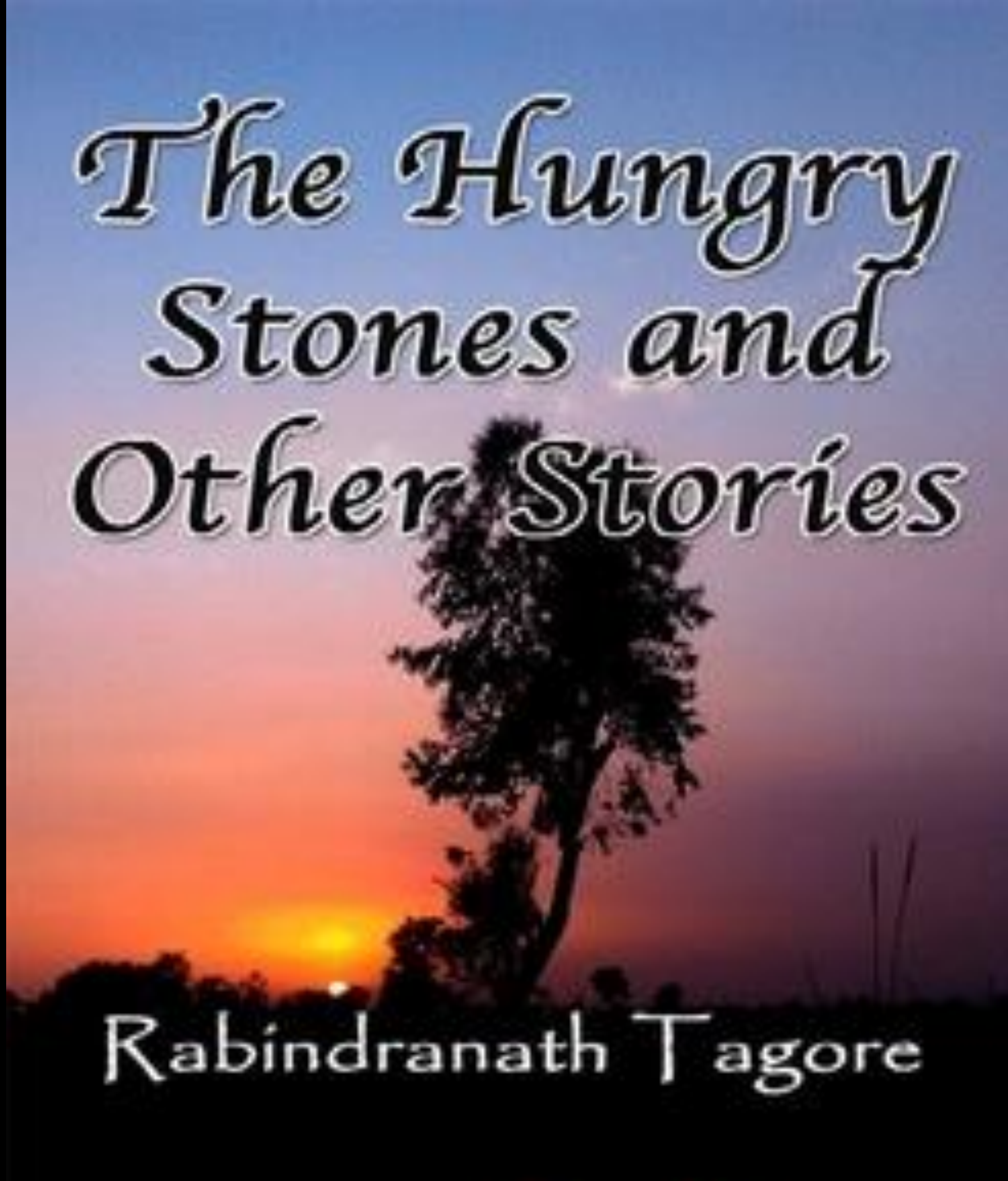
Center for
Molecular
Modeling

Department of
Materials Science
and Engineering

UNIVERSITEIT
GENT

stefaan.cottenier@ugent.be

how do we teach science ?


The Hungry Stones and Other Stories
Rabindranath Tagore

we repeat
the book

why do we teach the way we do ?


Laurencius. de.
Voltolina pinxit

inertia

is this teaching efficient ?

information loss


lenovo


TAB
Q W E R T Z U I O P Ü
A S D F G H J K L Ö Ä
Y X C V B N M

information loss
&
we don’t know
their problems

they all
know it

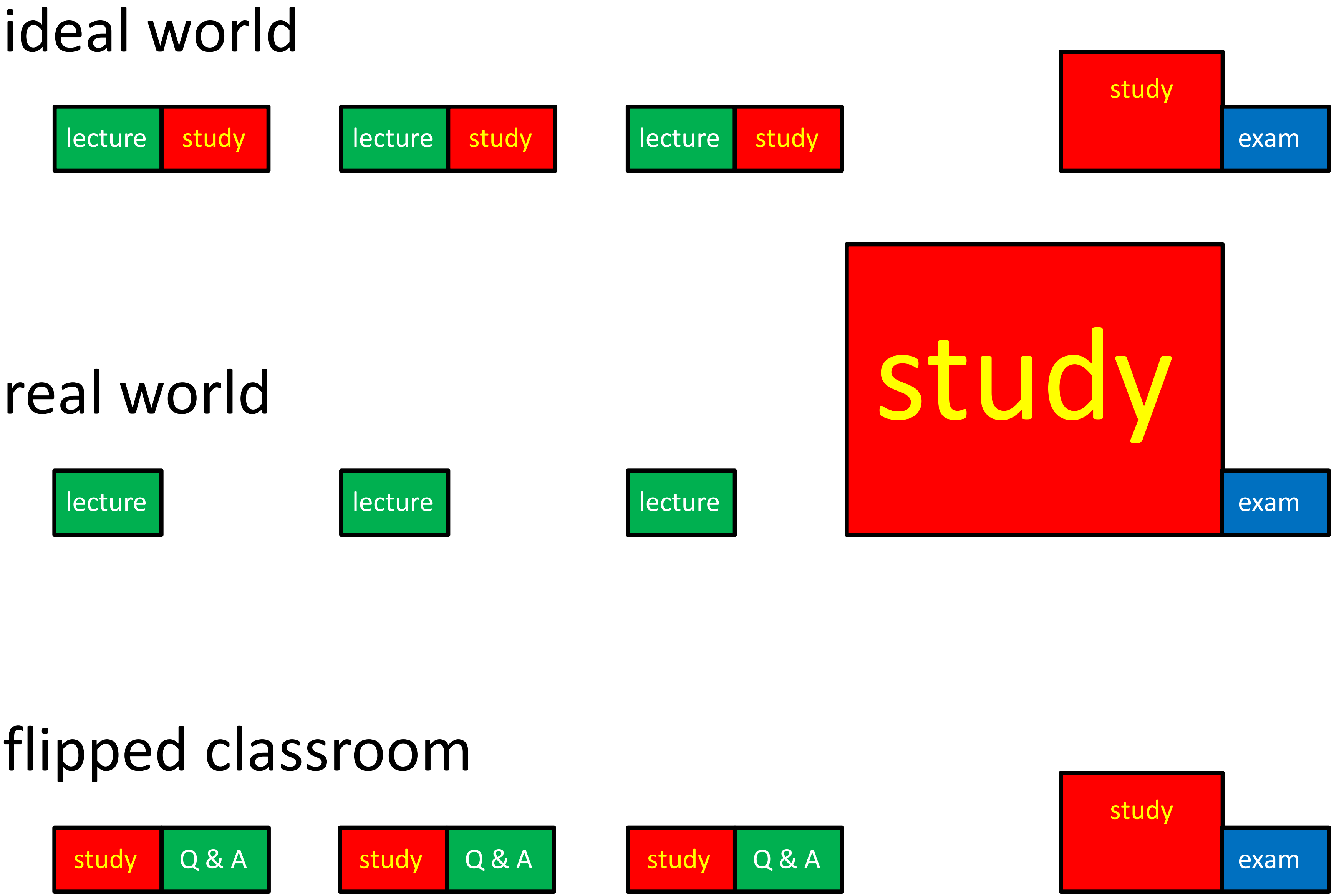
Dear professor,

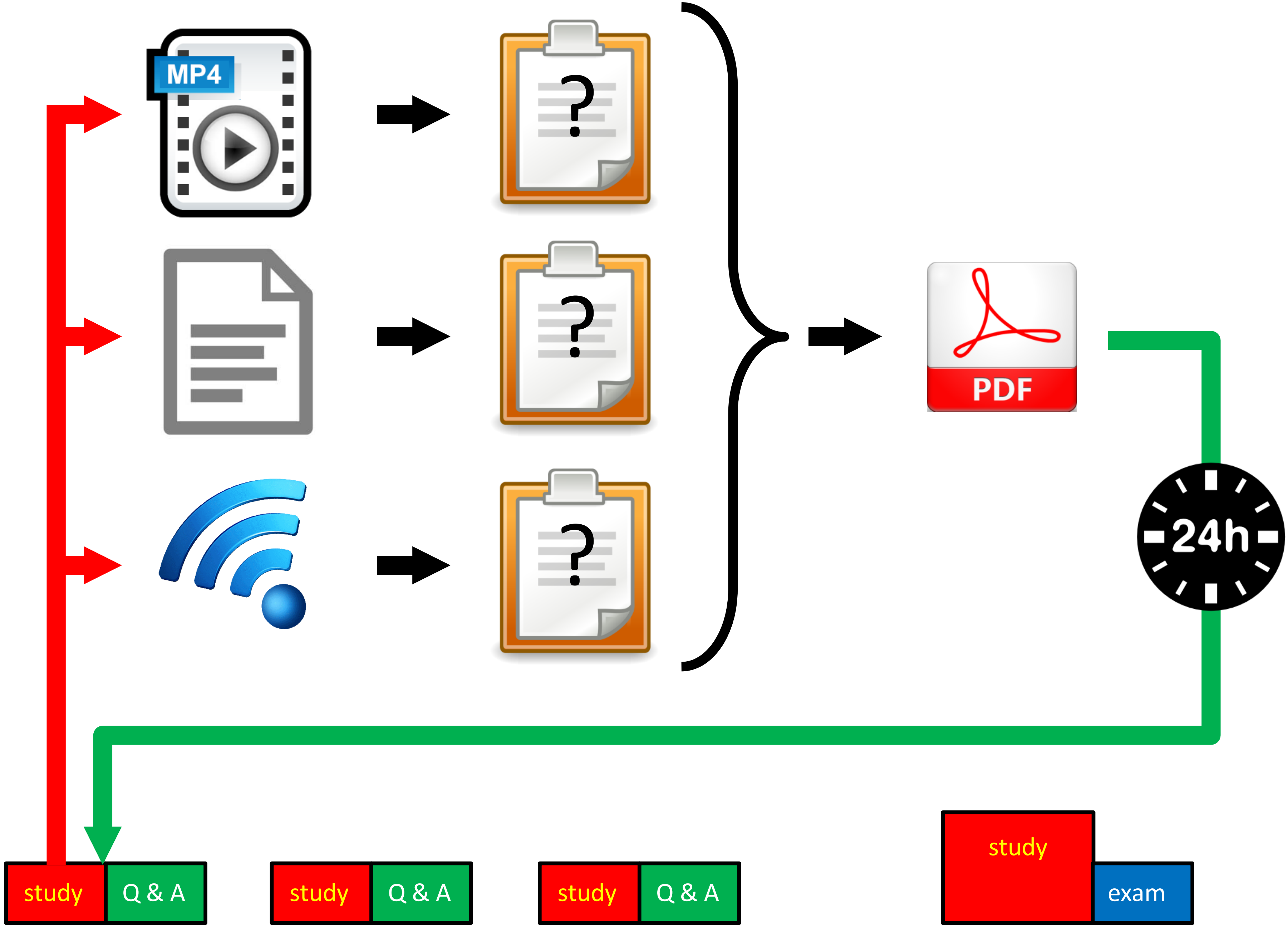
Due to an appointment
that was fixed long ago,
I will not be able to attend
the first lecture
of your course next week.

Do I miss something important
if I skip this first lecture?

Yours sincerely,
<....>

can we improve ?

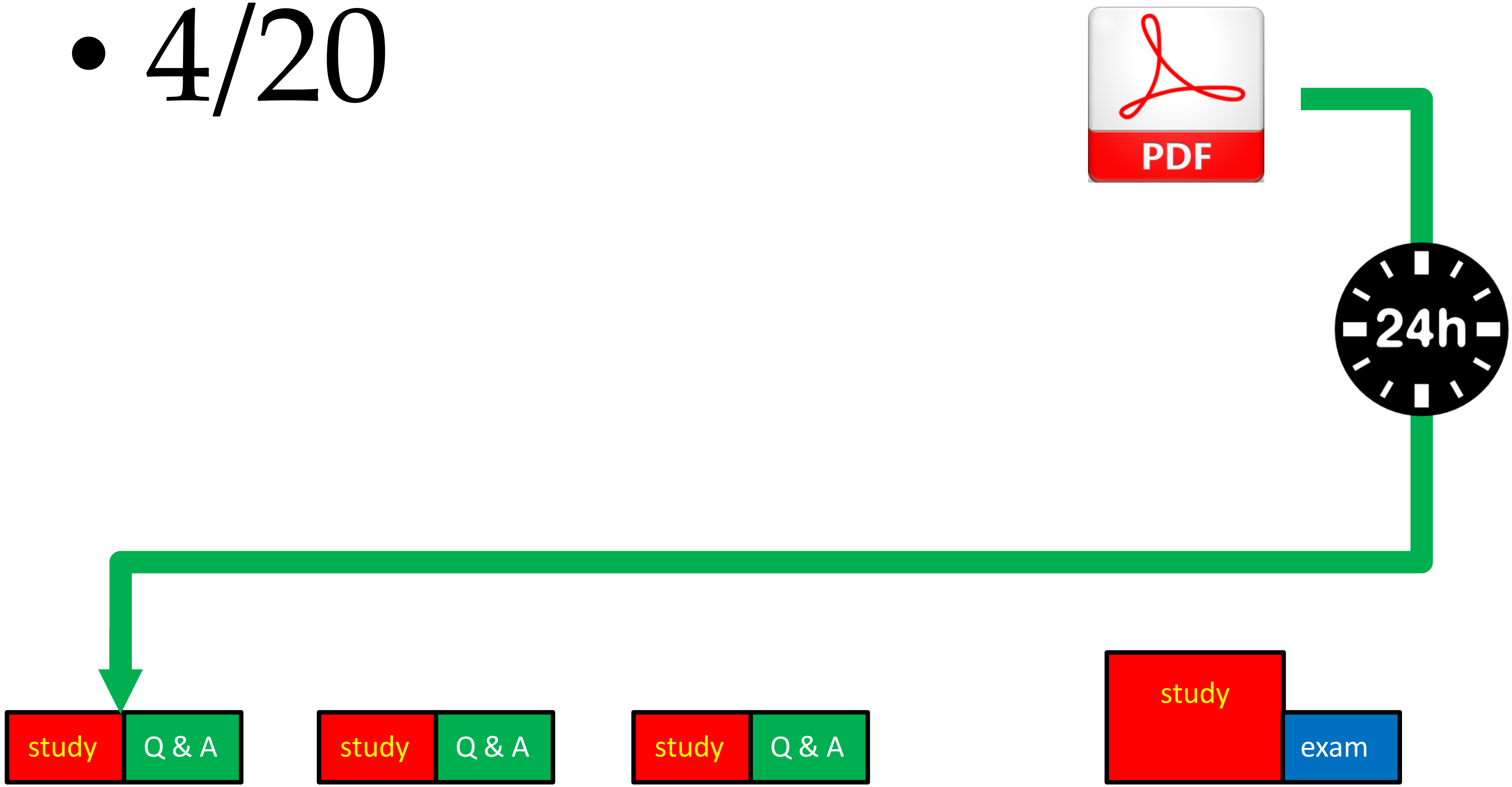

ideal world
lecture
study
lecture
study
lecture
study
study
exam
real world
lecture
lecture
lecture
study
exam
flipped classroom
study
Q & A
study
Q & A
study
Q & A
study
exam


MP4
PDF
24h
study
Q & A
study
Q & A
study
Q & A
study
exam

avoid covering
pre-class material
once again in class


Will they do this ?

- social pressure
- 4/20



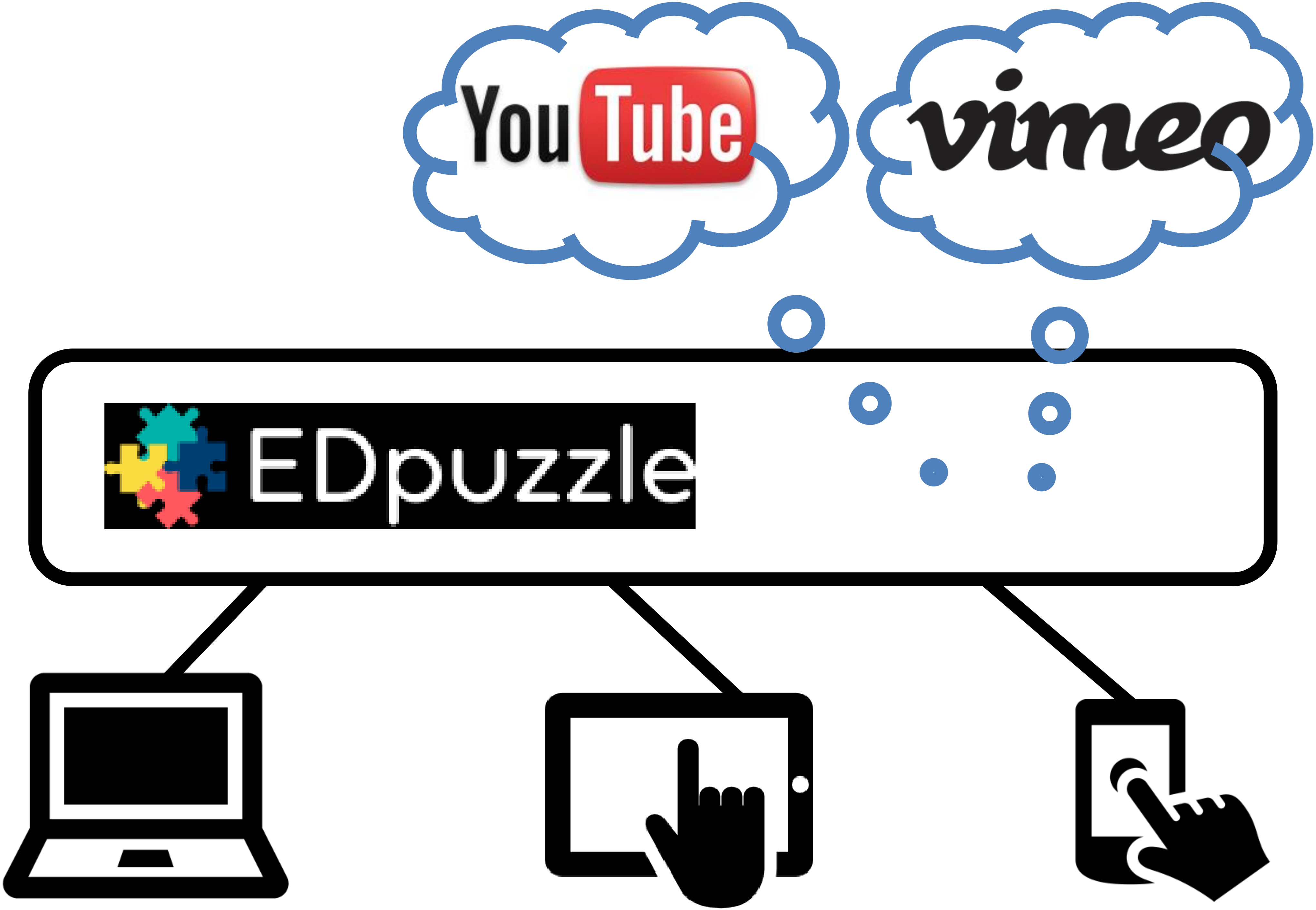
pre-class material


PPT
Camtasia Studio®
Version 8.0
©2012 TechSmith Corporation • www.techsmith.com • 2405 Woodlake Drive •
kemos, MI 48864-5910 USA
MP4
?

videofragment 1

keep videos short: 6-9 minutes

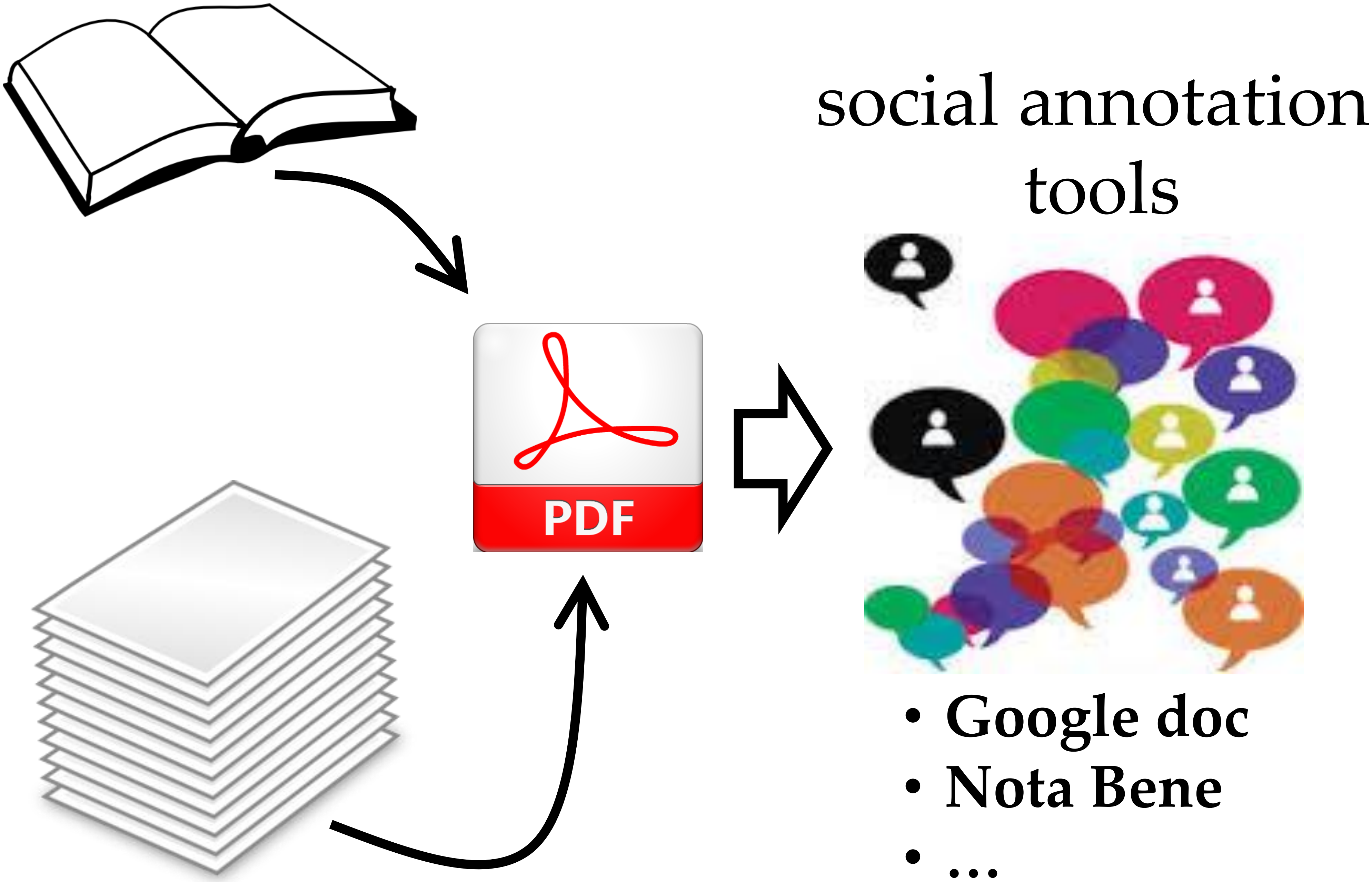
- attention curve
- easier to change

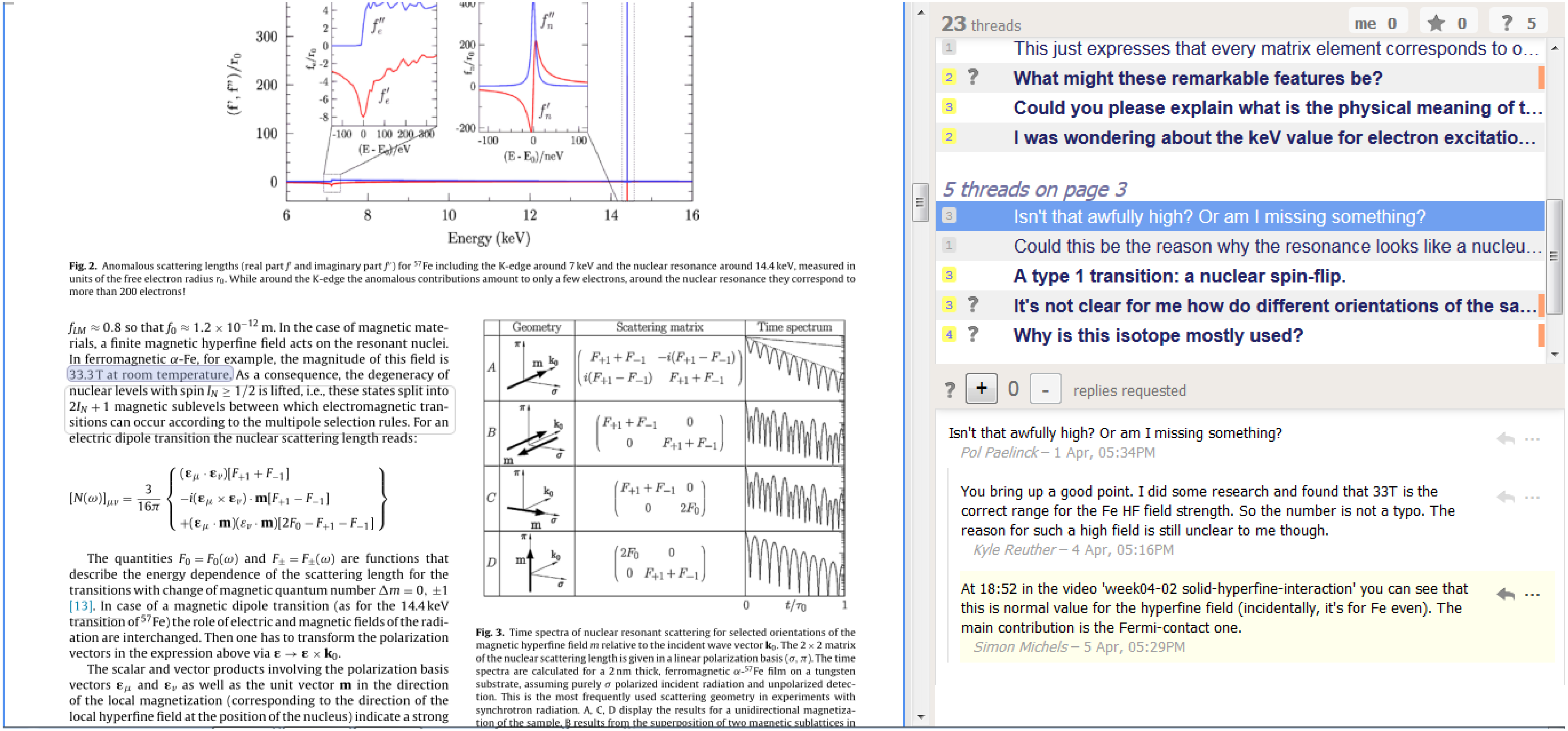

YouTube
vimeo
EDpuzzle

?
?
?
?
?
?
?
0:16
03:35


should
every teacher
now become
a video developer ?

pre-class material


social annotation tools
PDF
• Google doc
• Nota Bene
• ...


Energy (keV)
(f', f'')/r₀
(E - E₀)/eV
(E - E₀)/neV
Fig. 2. Anomalous scattering lengths (real part f' and imaginary part f'') for 57Fe including the K-edge around 7 keV and the nuclear resonance around 14.4 keV, measured in units of the free electron radius r₀. While around the K-edge the anomalous contributions amount to only a few electrons, around the nuclear resonance they correspond to more than 200 electrons!
f_LM ≈ 0.8 so that f₀ ≈ 1.2 × 10⁻¹² m. In the case of magnetic materials, a finite magnetic hyperfine field acts on the resonant nuclei. In ferromagnetic α-Fe, for example, the magnitude of this field is 33.3 T at room temperature. As a consequence, the degeneracy of nuclear levels with spin I_N ≥ 1/2 is lifted, i.e., these states split into 2I_N + 1 magnetic sublevels between which electromagnetic transitions can occur according to the multipole selection rules. For an electric dipole transition the nuclear scattering length reads:
The quantities F₀ = F₀(ω) and F± = F±(ω) are functions that describe the energy dependence of the scattering length for the transitions with change of magnetic quantum number Δm = 0, ±1 [13]. In case of a magnetic dipole transition (as for the 14.4 keV transition of 57Fe) the role of electric and magnetic fields of the radiation are interchanged. Then one has to transform the polarization vectors in the expression above via ε → ε × k₀.
The scalar and vector products involving the polarization basis vectors ε_μ and ε_ν as well as the unit vector m in the direction of the local magnetization (corresponding to the direction of the local hyperfine field at the position of the nucleus) indicate a strong
Geometry
Scattering matrix
Time spectrum
Fig. 3. Time spectra of nuclear resonant scattering for selected orientations of the magnetic hyperfine field m relative to the incident wave vector k₀. The 2 × 2 matrix of the nuclear scattering length is given in a linear polarization basis (σ, π). The time spectra are calculated for a 2 nm thick, ferromagnetic α-57Fe film on a tungsten substrate, assuming purely σ polarized incident radiation and unpolarized detection. This is the most frequently used scattering geometry in experiments with synchrotron radiation. A, C, D display the results for a unidirectional magnetization of the sample, B results from the superposition of two magnetic sublattices in
23 threads
me 0
0
? 5
This just expresses that every matrix element corresponds to o...
What might these remarkable features be?
Could you please explain what is the physical meaning of t...
I was wondering about the keV value for electron excitatio...
5 threads on page 3
Isn't that awfully high? Or am I missing something?
Could this be the reason why the resonance looks like a nucleu...
A type 1 transition: a nuclear spin-flip.
It's not clear for me how do different orientations of the sa...
Why is this isotope mostly used?
0
replies requested
Isn't that awfully high? Or am I missing something?
Pol Paelinck – 1 Apr, 05:34PM
You bring up a good point. I did some research and found that 33T is the correct range for the Fe HF field strength. So the number is not a typo. The reason for such a high field is still unclear to me though.
Kyle Reuther – 4 Apr, 05:16PM
At 18:52 in the video 'week04-02 solid-hyperfine-interaction' you can see that this is normal value for the hyperfine field (incidentally, it's for Fe even). The main contribution is the Fermi-contact one.
Simon Michels – 5 Apr, 05:29PM

nb.mit.edu

ideal for existing courses
with good text-based material

pre-class material



www

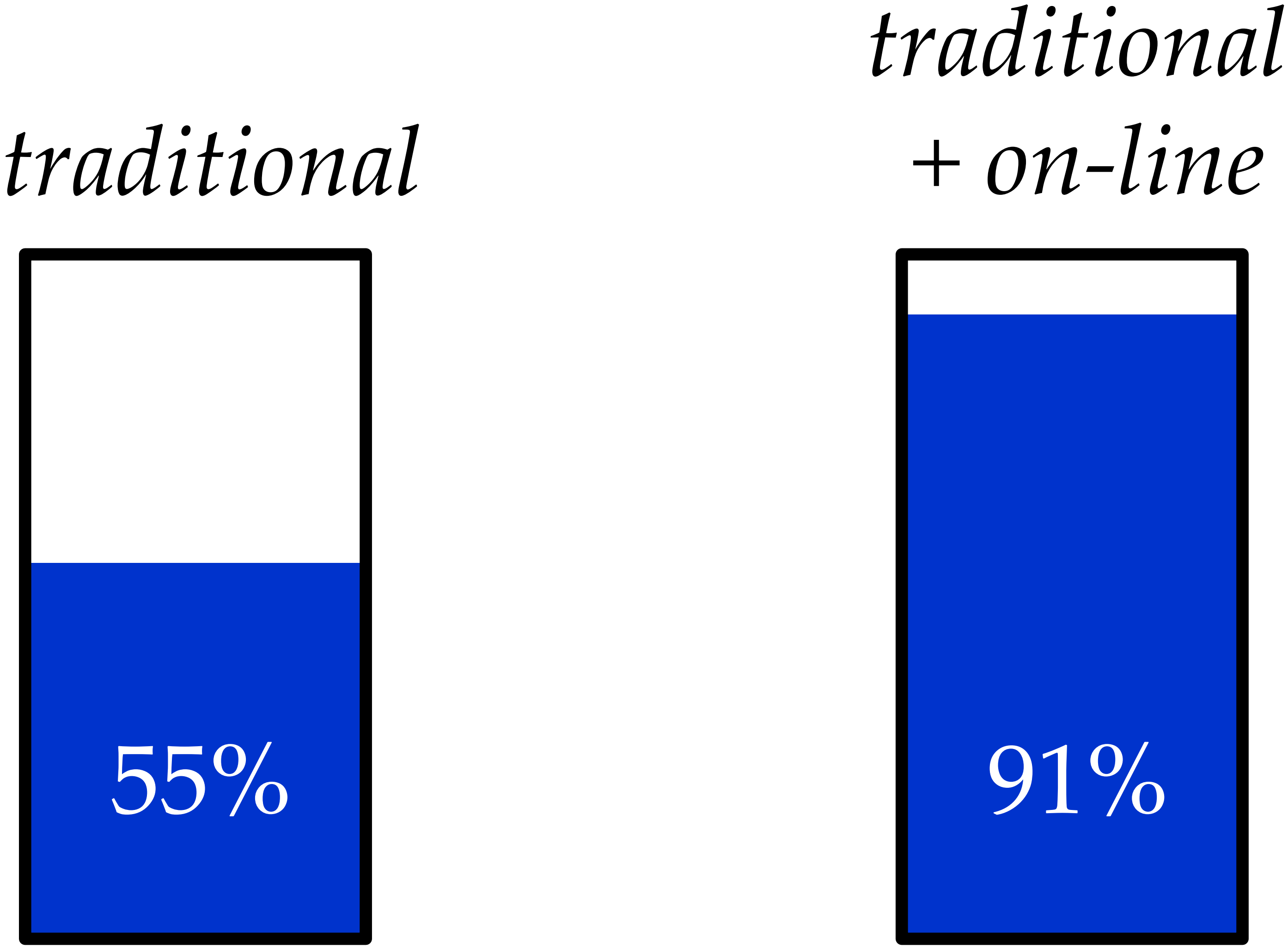
show me
some
results !

results

learning

gain

San Jose State and edX (fall 2012)

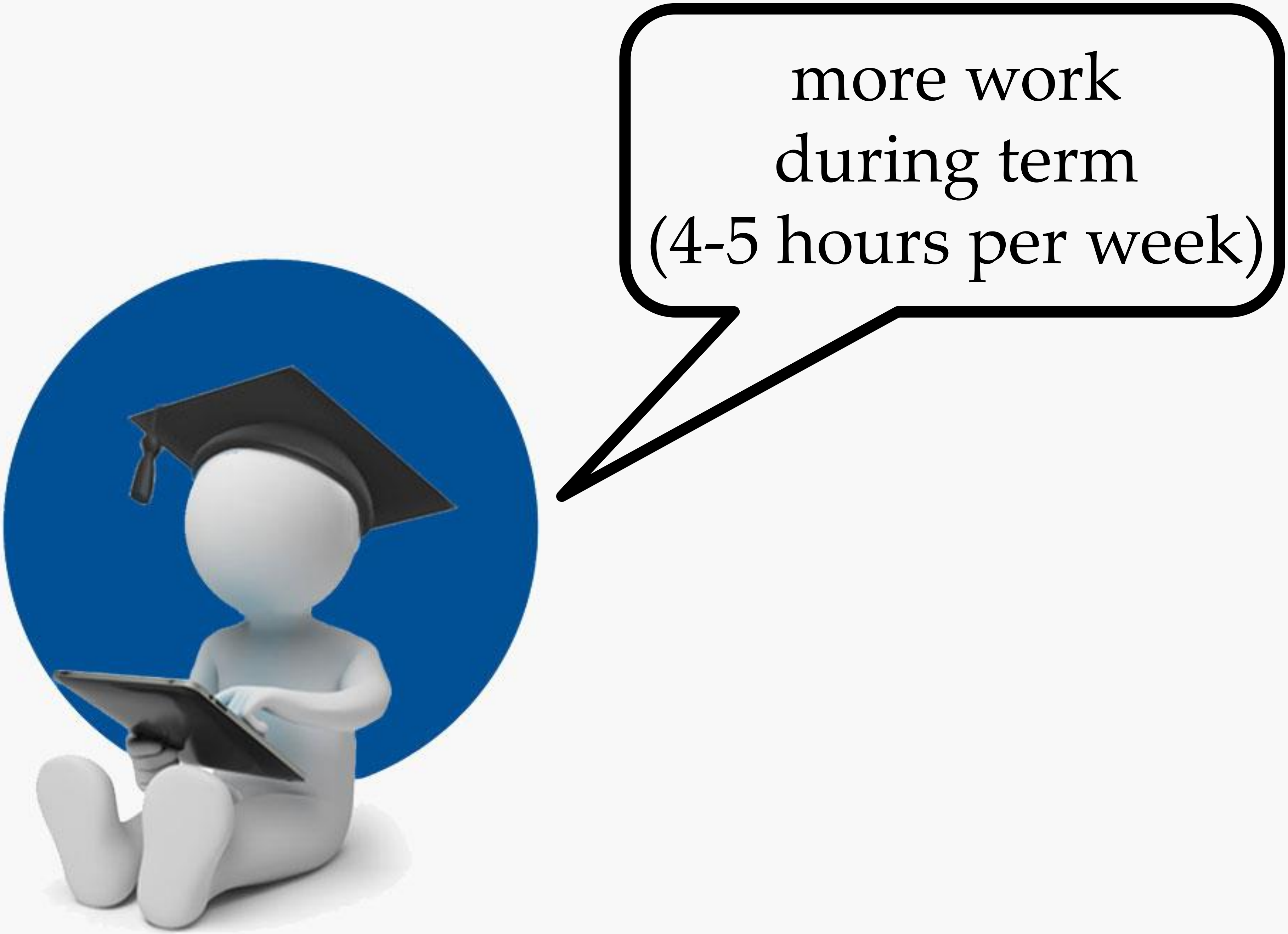


http://online.wsj.com/news/articles/SB10001424052702303759604579093400834738972?mg=reno64-wsj&url=http%3A%2F%2Fonline.wsj.com%2Farticle%2FSB10001424052702303759604579093400834738972.html

results

study

behaviour


more work
during term
(4-5 hours per week)


less work
in the weeks
before the exam

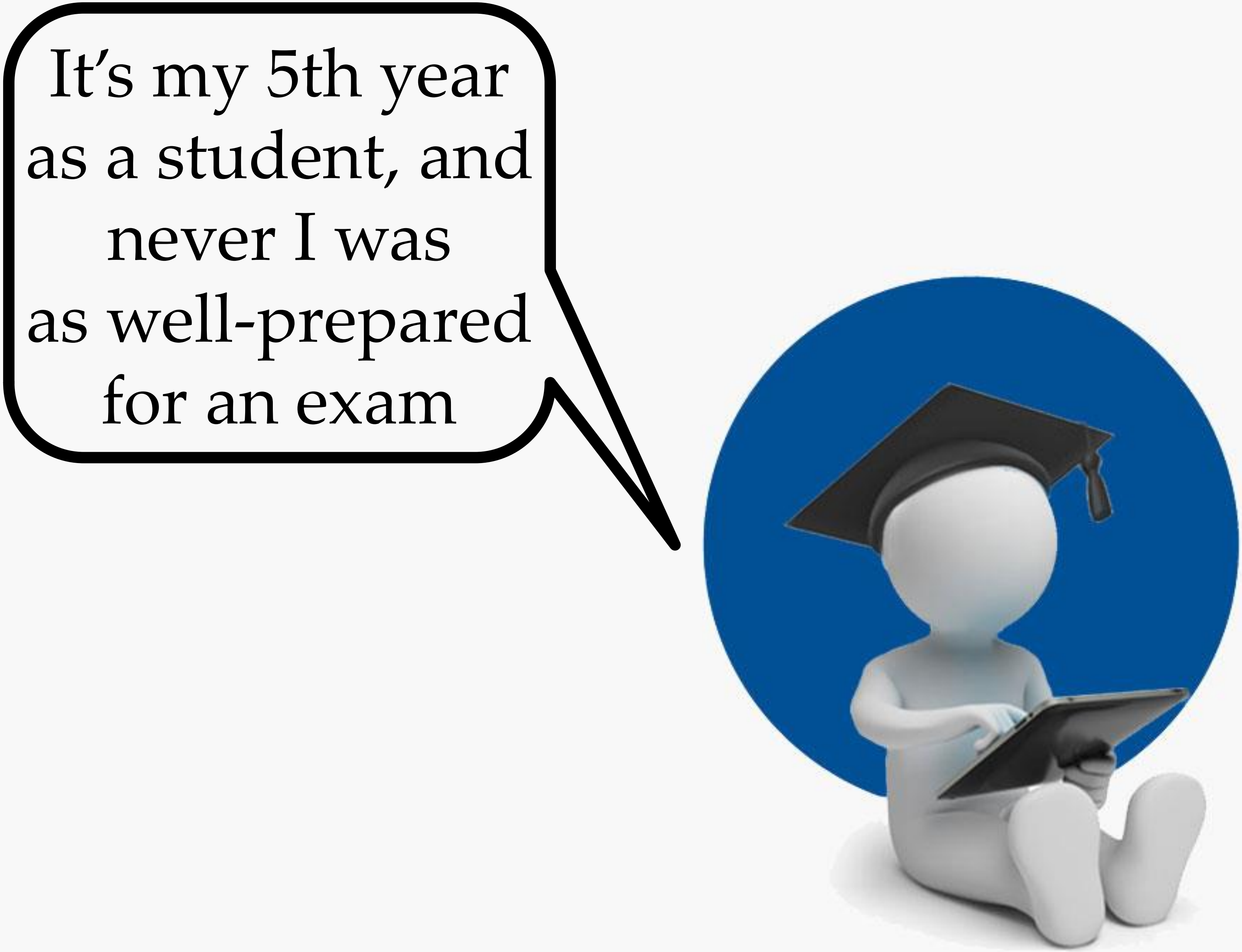

I watched every video 2-3 times

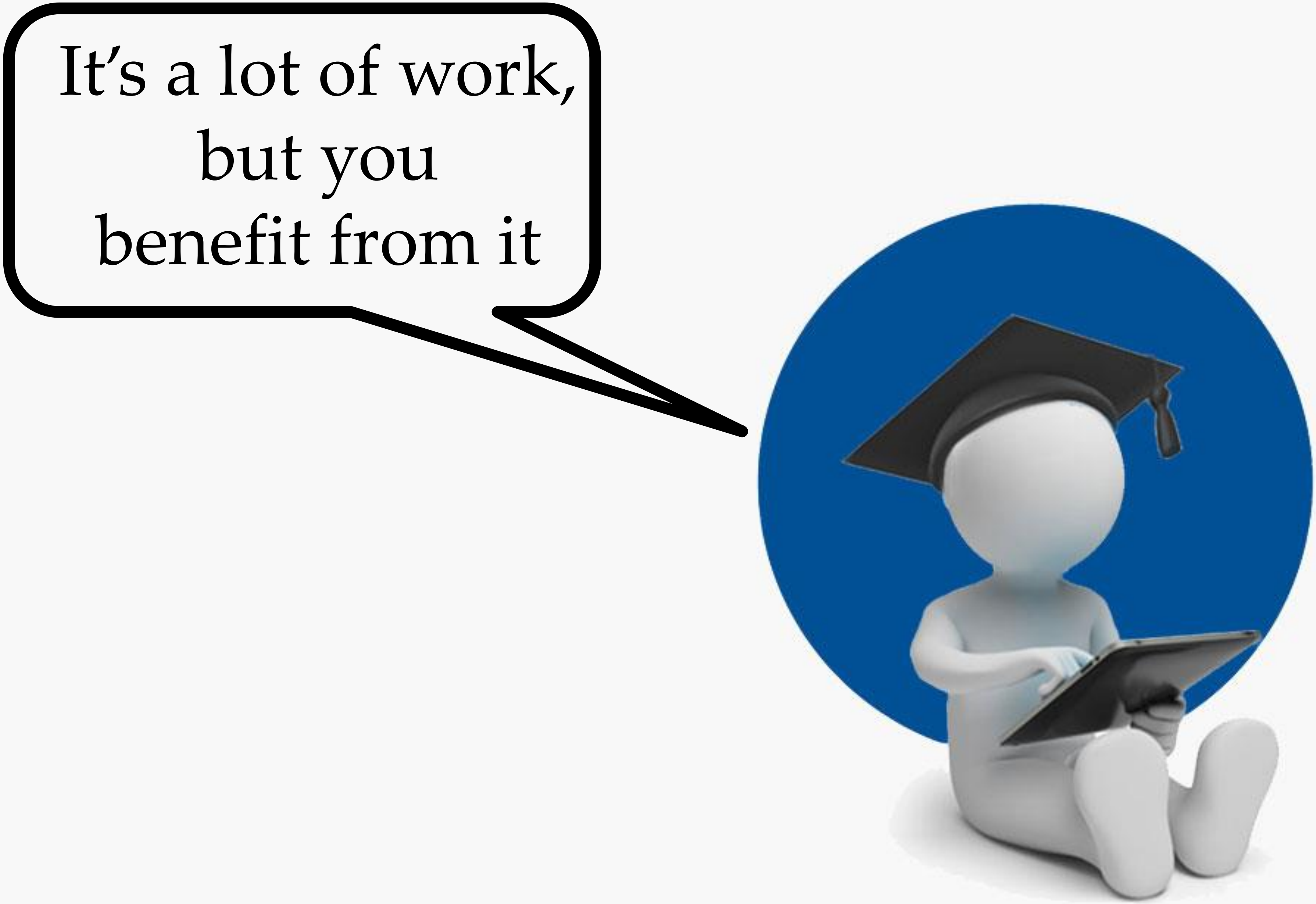

make notes during watching !

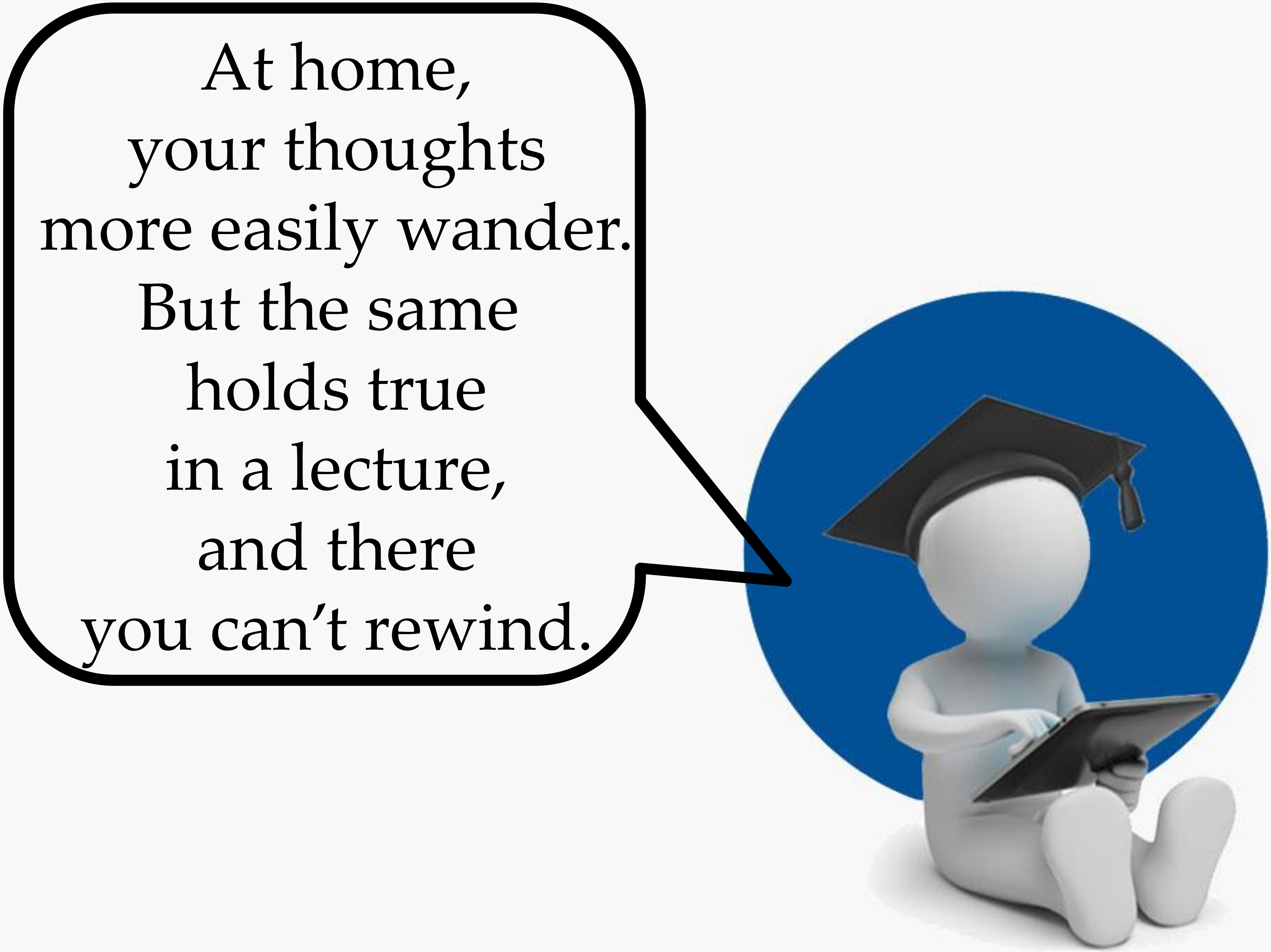
Computational Materials Physics @ TIFR (August 2015)

results

appreciation


It’s my 5th year as a student, and never I was as well-prepared for an exam


It's a lot of work,
but you
benefit from it


At home, your thoughts more easily wander. But the same holds true in a lecture, and there you can't rewind.

time pressure
if all teachers
would do this ?

economize on class time !

results

teacher’s time

You don’t gain time

You don't gain time,
but you spend it better.

something

for me ?

- [x] each year, I tell my same story
- [x] my students are not responsive at all
- [ ] for some students my course goes too fast, for others it goes too slowly

my talks on YouTube
http://goo.gl/P2b1Hs

stefaan.cottenier@ugent.be