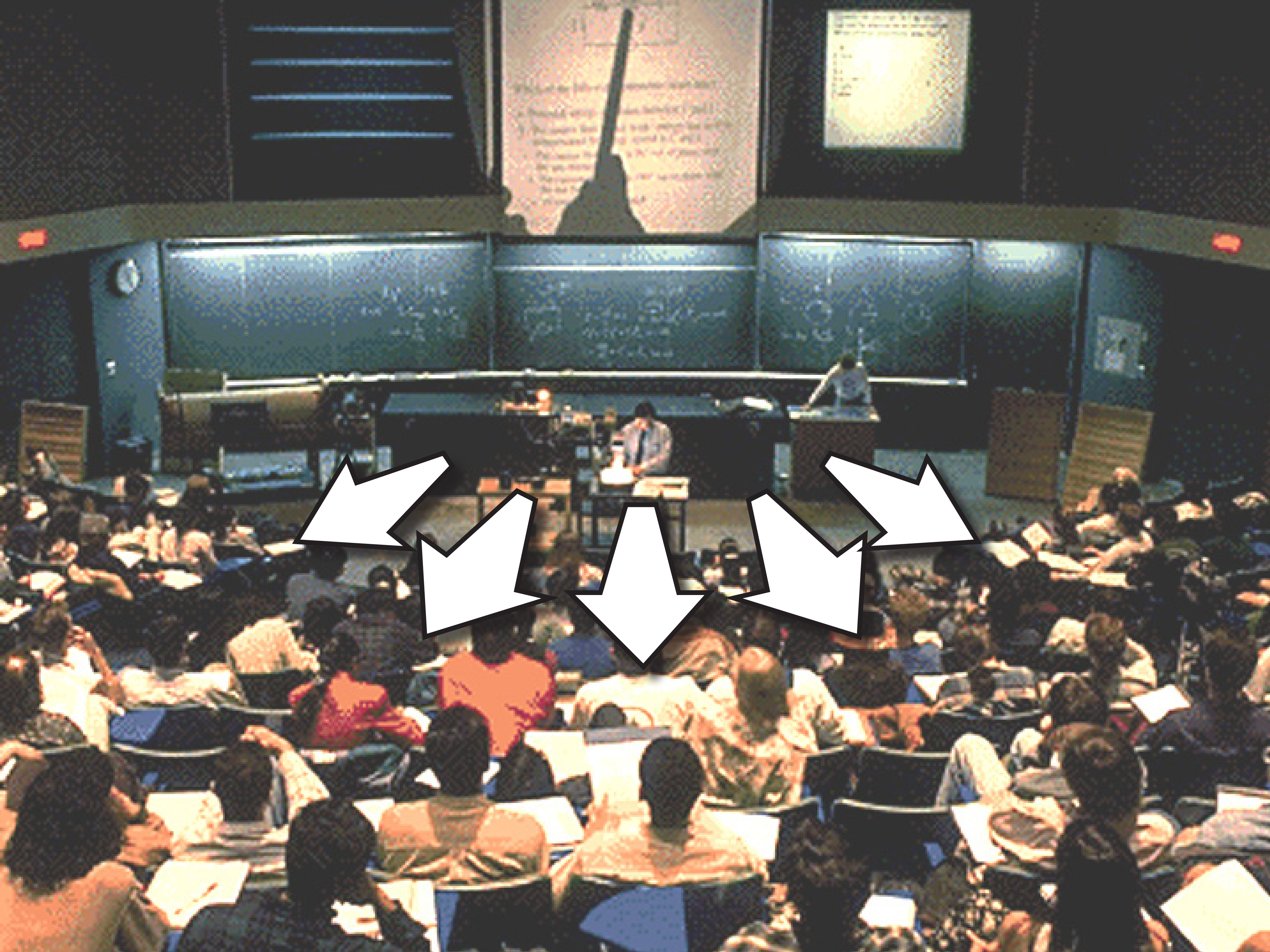
Getting every student prepared for every class

Kent State University
Kent, OH, 24 February 2017

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1st exposure
deeper understanding


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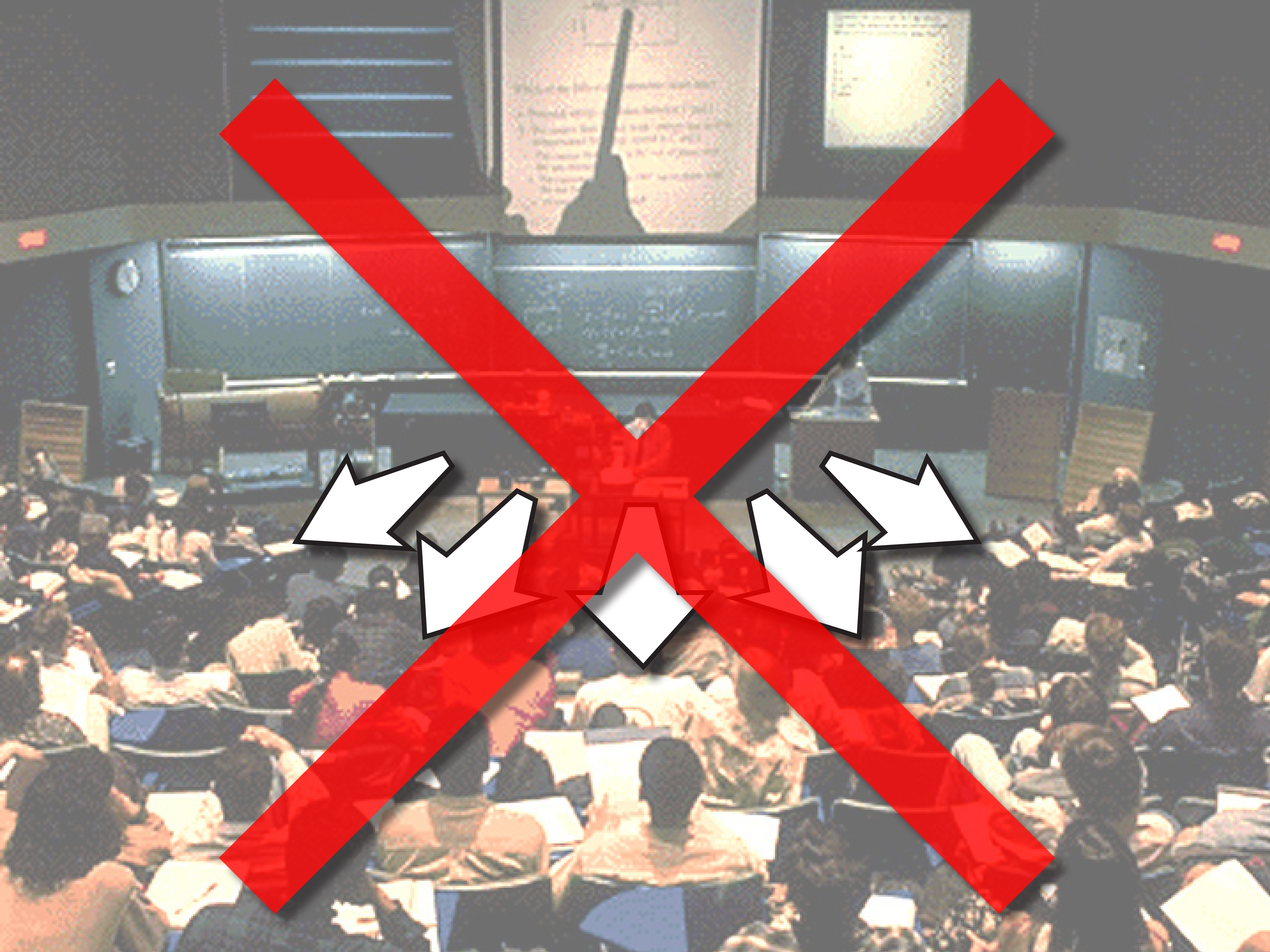
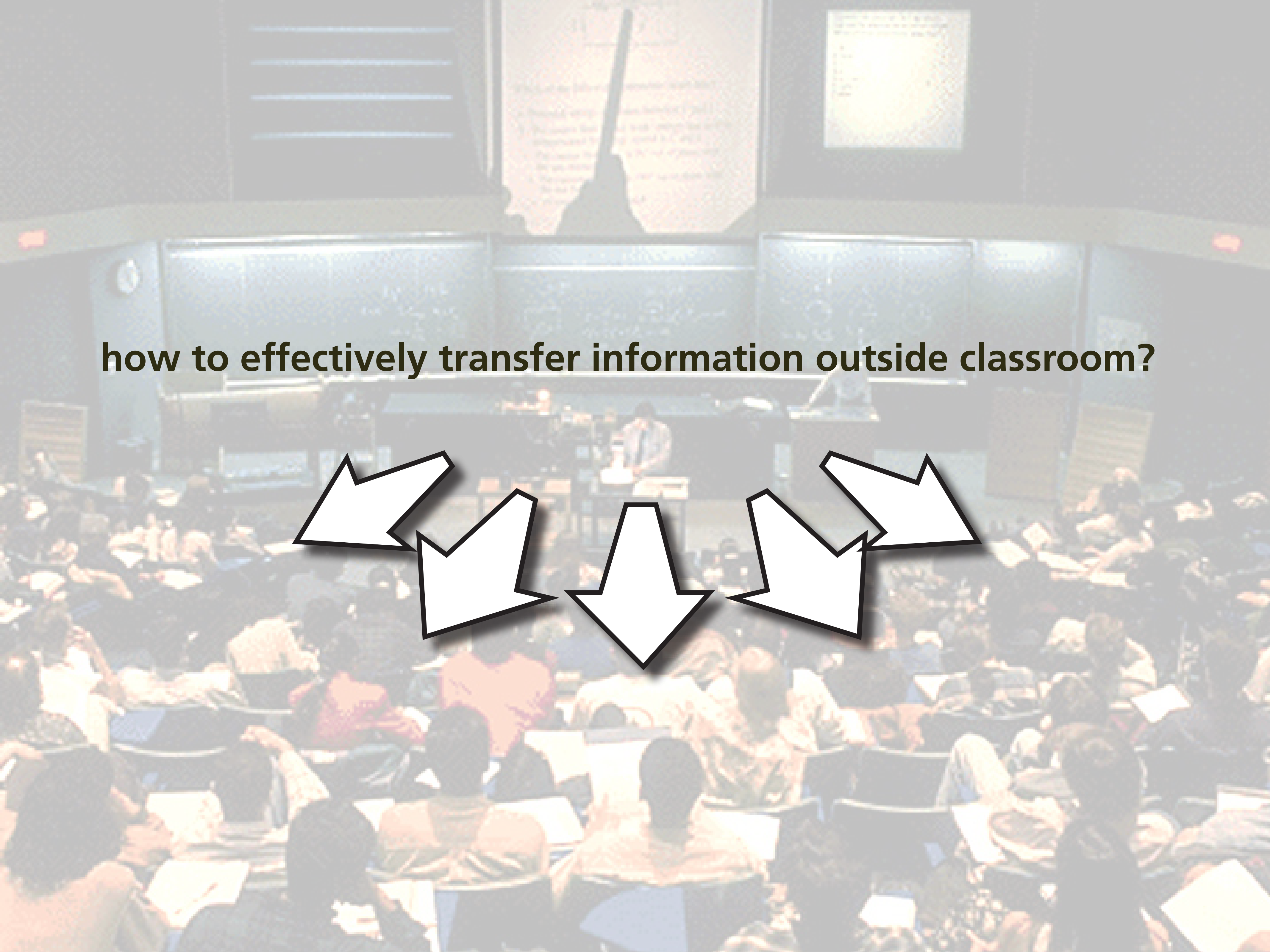


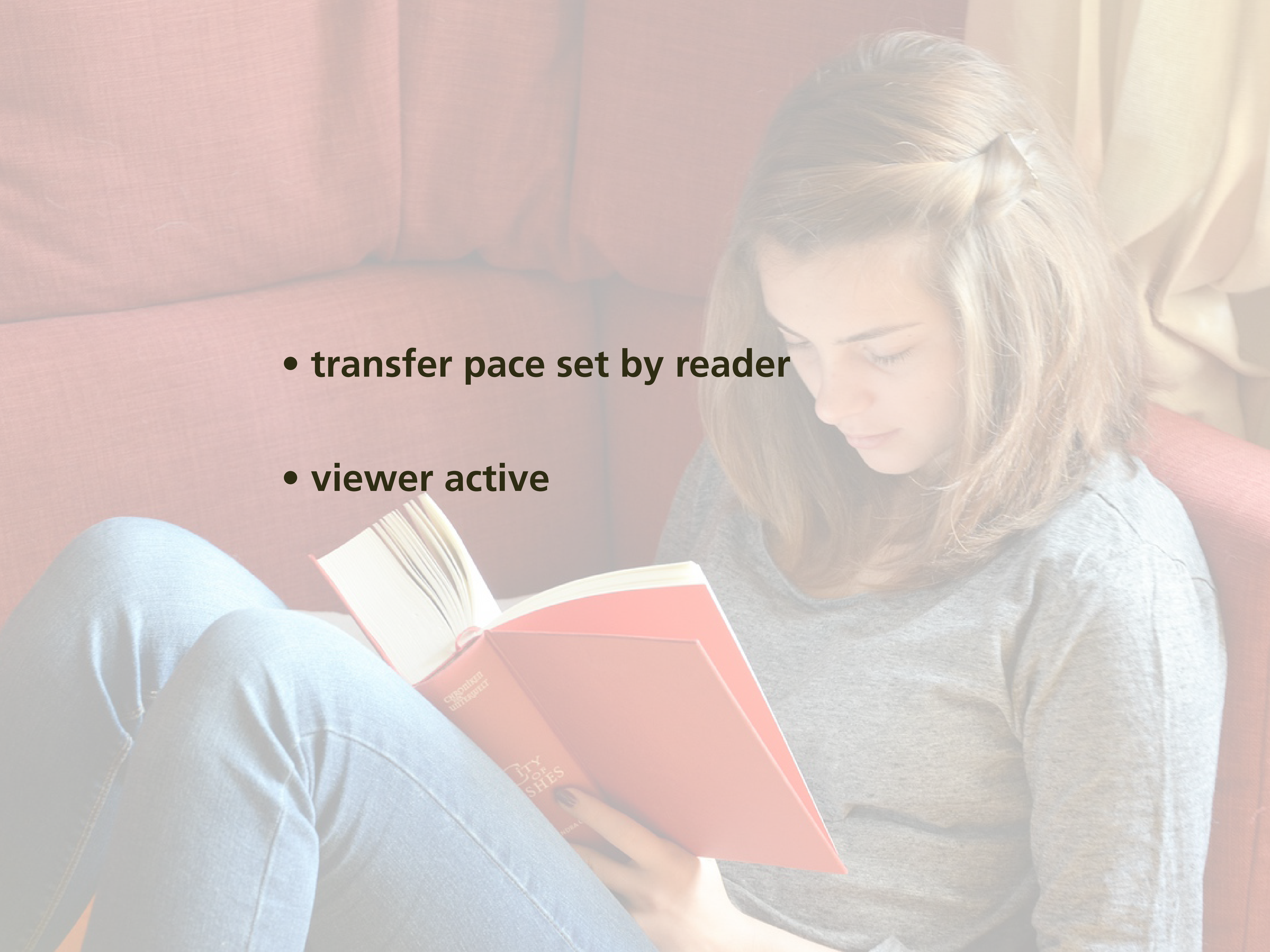

how to effectively transfer information outside classroom?


P=4a
a
d


but…

- **transfer pace set by video**
- **viewer passive**
- **viewing/attention tanks as time passes**
- **isolated/individual experience**

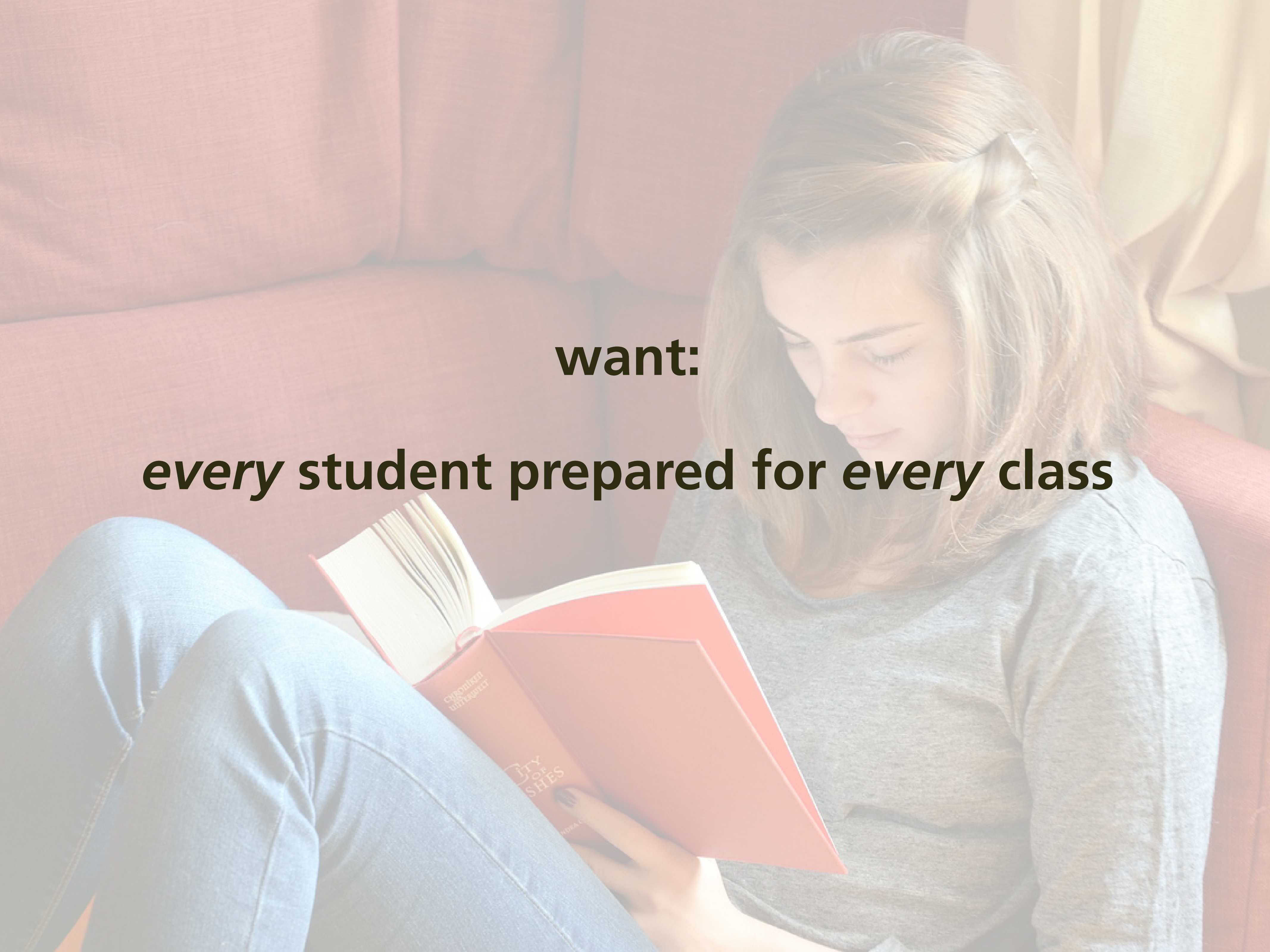

we’re simply moving this outside classroom!



- **transfer pace set by reader**
- **viewer active**

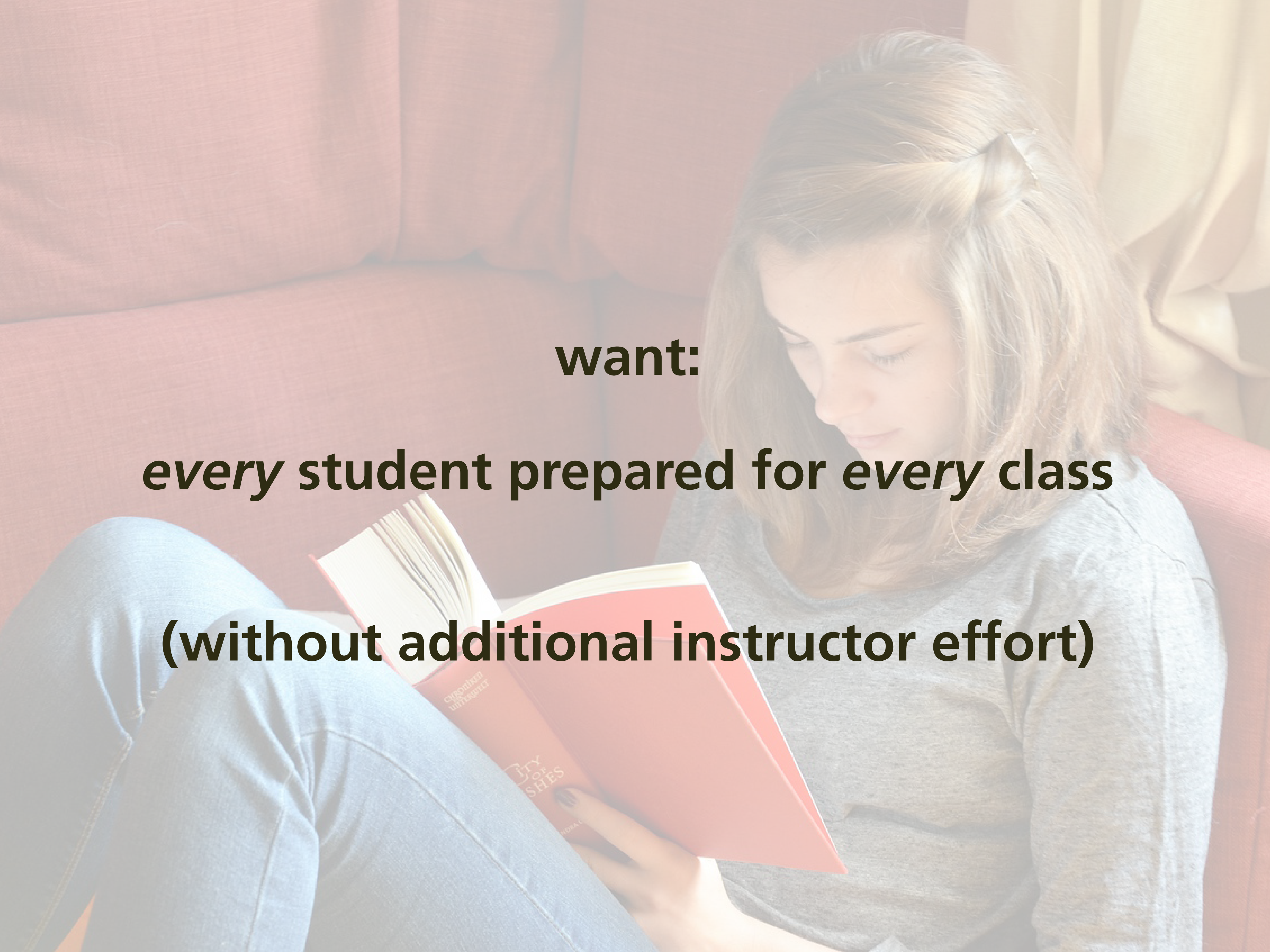
but…


isolated/individual experience &
no real accountability



want:

every student prepared for *every* class



want:

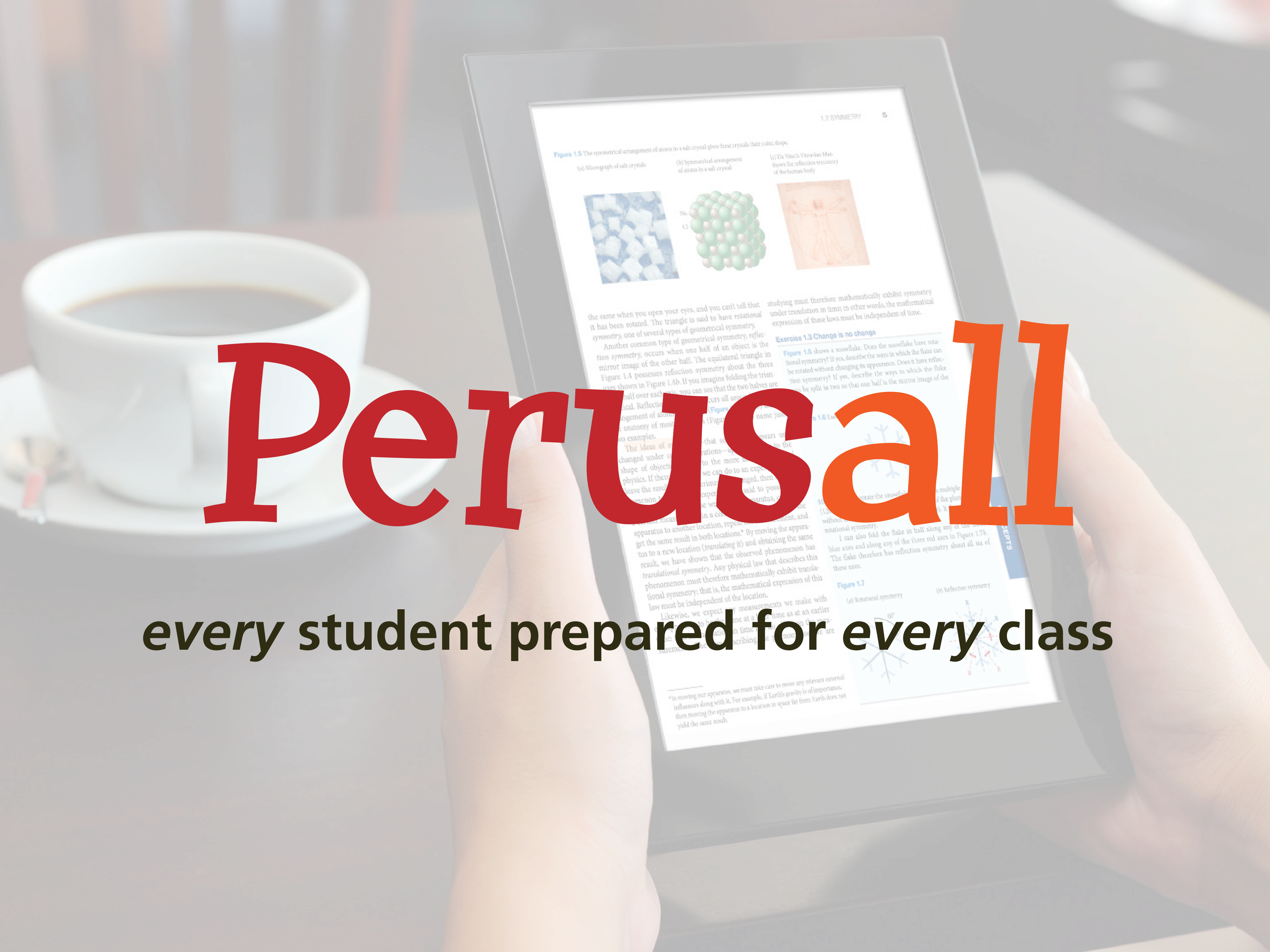
every student prepared for *every* class

(without additional instructor effort)

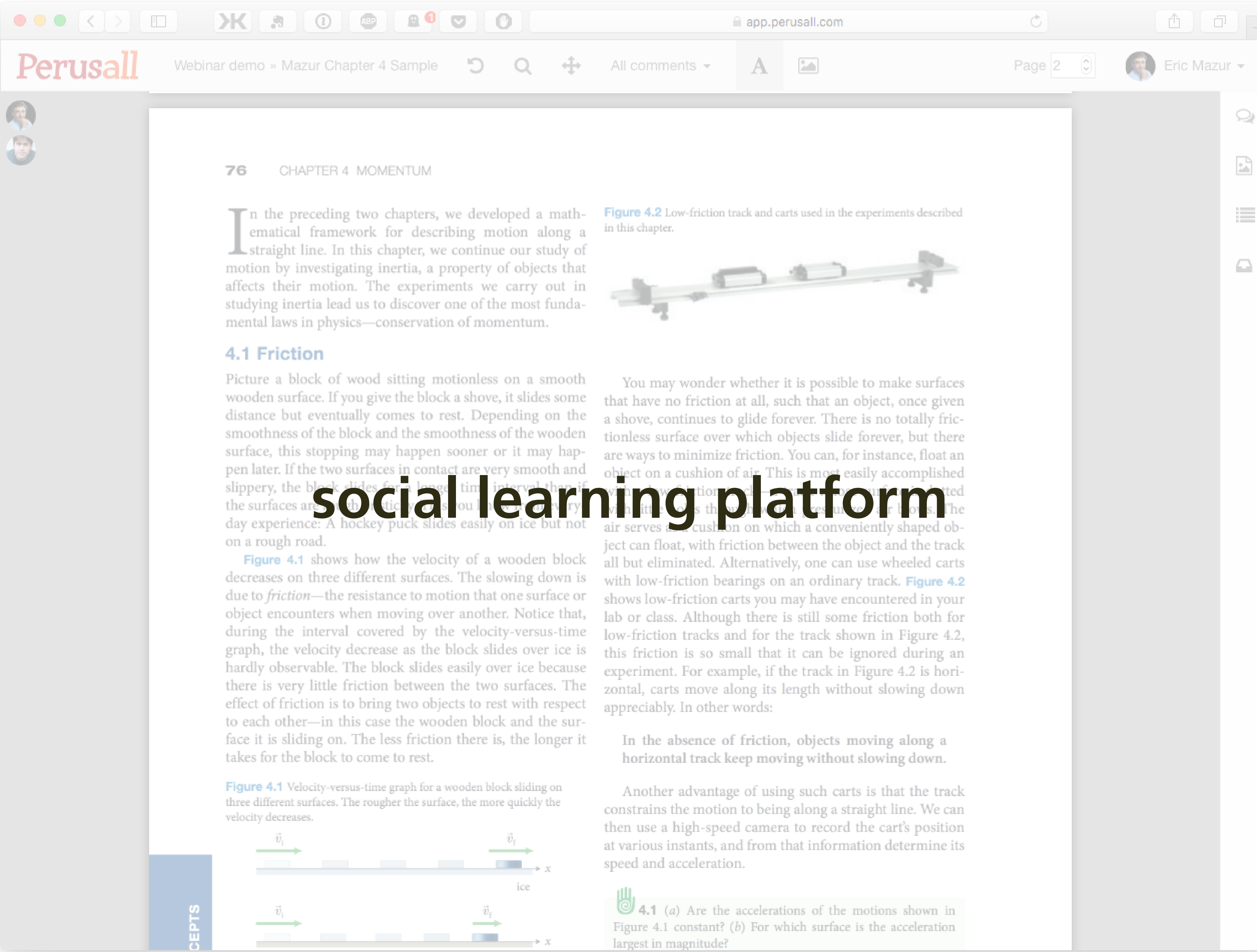
Solution

turn out-of-class component

also into a social interaction!



Perusall
every student prepared for *every* class



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All comments
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Eric Mazur
76 CHAPTER 4 MOMENTUM
4.1 Friction
Figure 4.2 Low-friction track and carts used in the experiments described in this chapter.
Figure 4.1 Velocity-versus-time graph for a wooden block sliding on three different surfaces. The rougher the surface, the more quickly the velocity decreases.

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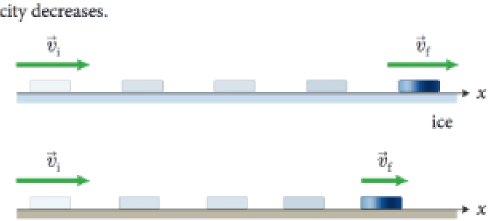

CEPTS

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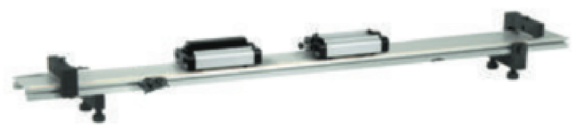

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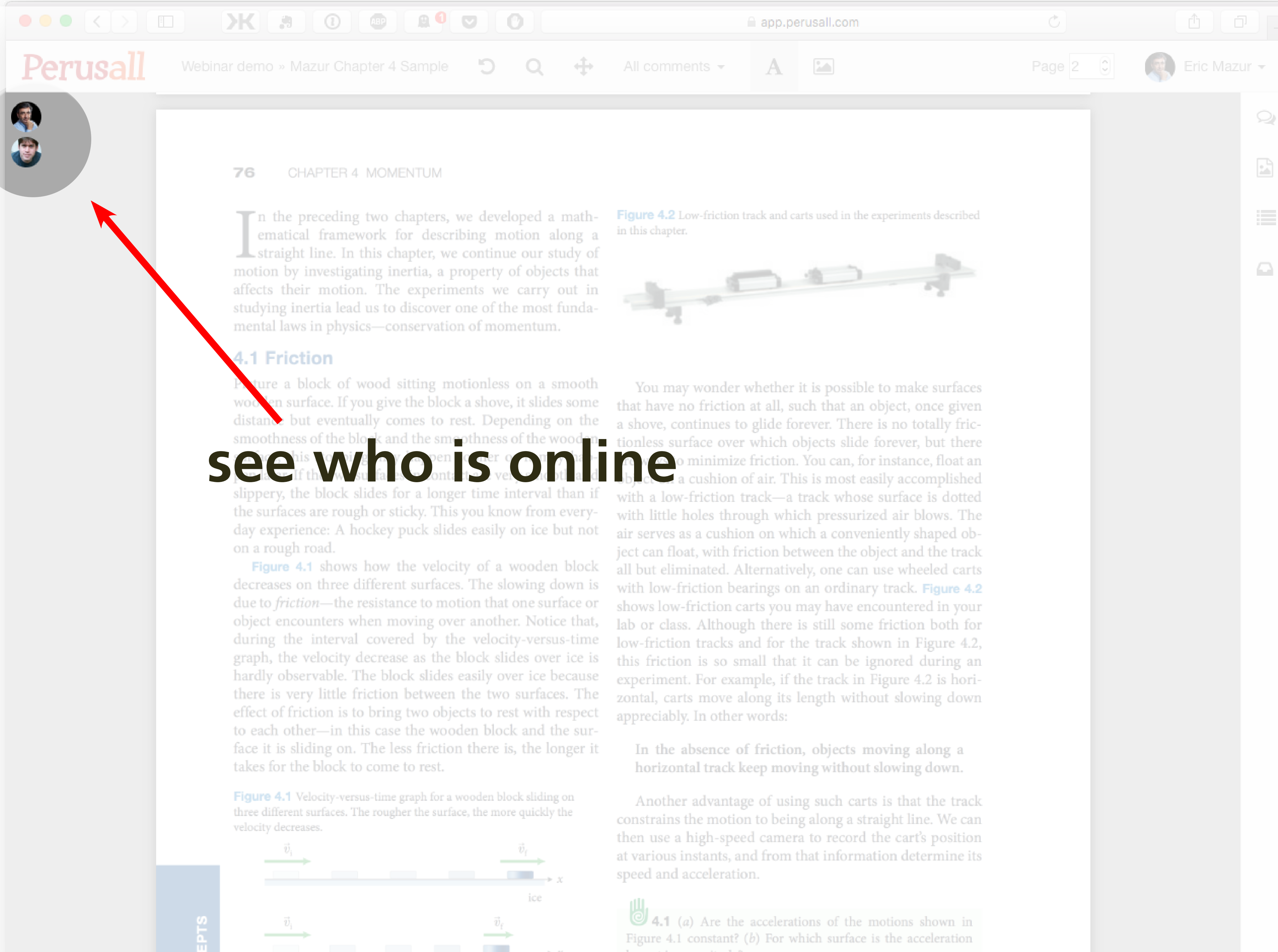
see who is online



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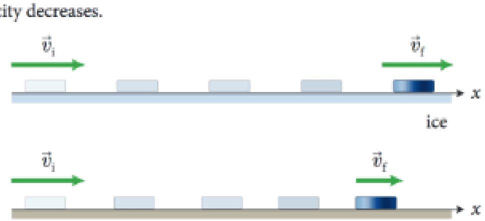

CEPTS

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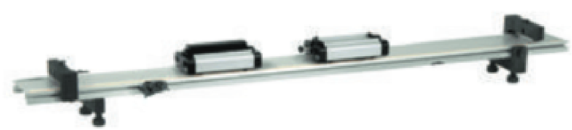

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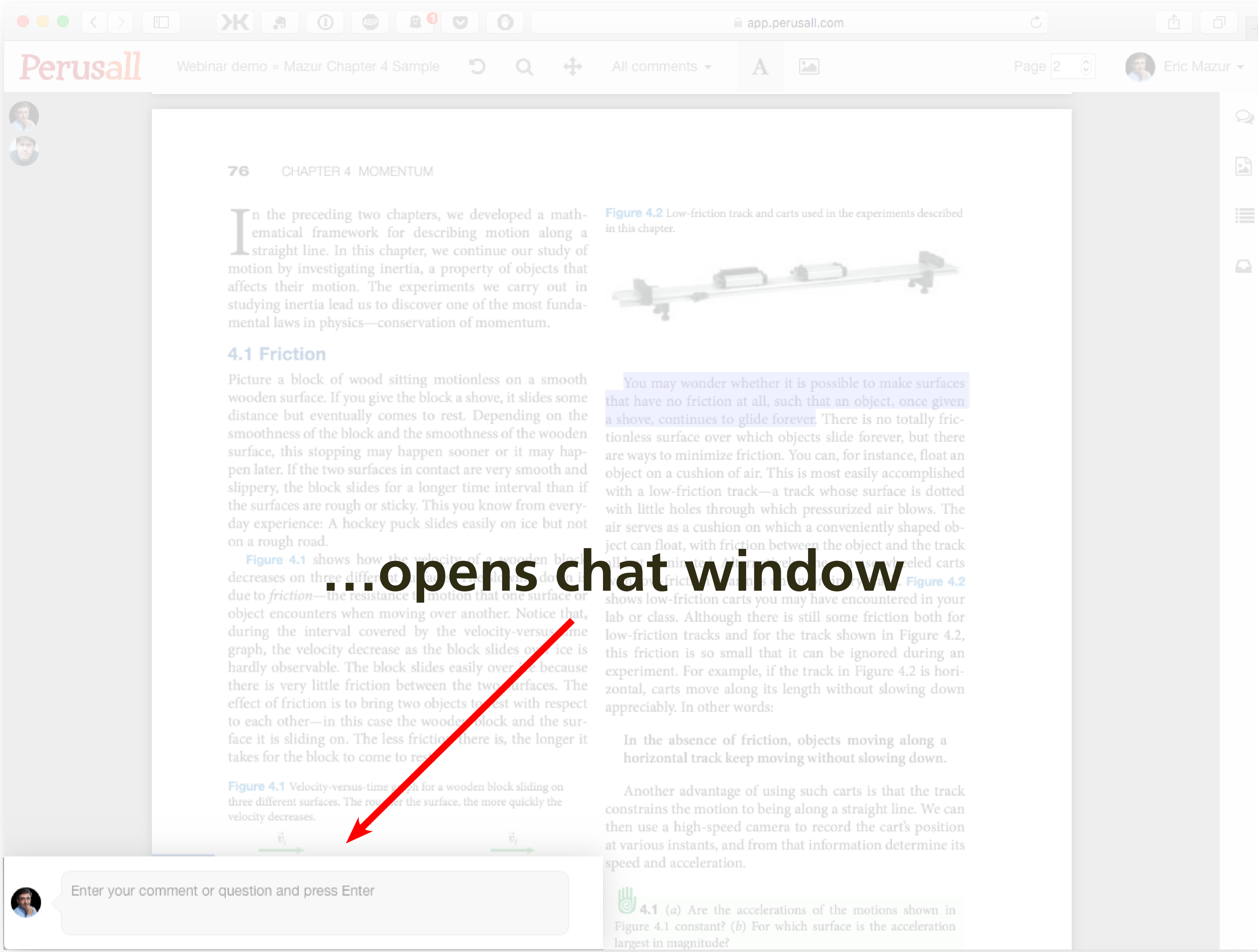

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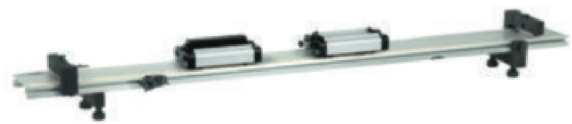

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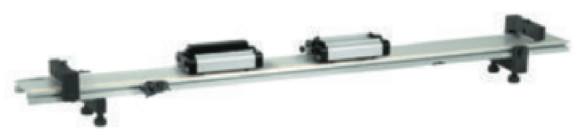

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Enter your comment or question and press Enter

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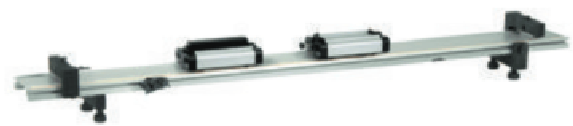

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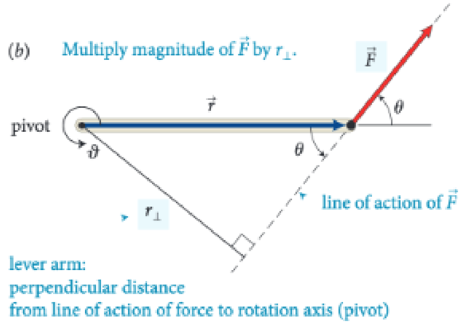


action of the force and the axis of rotation. So, the torque caused by a force exerted on an object is the product of the magnitude of the force and its lever arm distance. It can be written equivalently as $rF_\perp$ and as $r_\perp F$.

Like other rotational quantities, torque carries a sign that depends on the choice of direction for increasing ϑ. In Figure 12.4, for example, the torque caused by $\vec{F}_1$ about the pivot tends to rotate the rod in the direction of increasing ϑ and so is positive; the torque caused by $\vec{F}_2$ is negative. The sum of the two torques about the pivot is then $r_1F_1 + (-r_2F_2)$. As we've seen, the two torques are equal in magnitude when the rod is balanced, and so the sum of the torques is zero. When the sum of the torques is not zero, the rod's rotational acceleration is nonzero, and so its rotational velocity and angular momentum change.

CONCEPTS

In the situations depicted in Figures 12.4 and 12.5 we used the pivot to calculate the lever arm distances. This is a natural choice because that is the point about which the object under consideration is free to rotate. However, torques also play a role for stationary objects that are suspended or supported at several different points and that are not free to rotate—for example, a plank or bridge supported at either end. To determine what reference point to use in such cases, complete the following exercise.

Exercise 12.1 Reference point

Consider again the rod in Figure 12.4. Calculate the sum of the torques about the left end of the rod.

SOLUTION I begin by making a sketch of the rod and the three forces exerted on it, showing their points of application on the rod (Figure 12.6).

reference point

$\vec{F}_1$

The lever arm distances must now be determined relative to the left end of the rod. The lever arm distance of force $\vec{F}_1$ to this point is zero, and so the torque caused by that force about the left end of the rod is zero. If I choose counterclockwise as the positive direction of rotation, $\vec{F}_2$ causes a negative torque about the left end of the rod; the force $\vec{F}^c_{pr}$ exerted by the pivot causes a positive torque about the left end of the rod. The lever arm distance of $\vec{F}_2$ about the left end of the rod is $r_1 + r_2$; that of $\vec{F}^c_{pr}$ is r_1. Because the rod is at rest, the magnitude of the force exerted by the pivot is equal to the sum of the forces $\vec{F}_1$ and $\vec{F}_2$. Taking into account the signs of the torques, we find that the sum of the torques about the left end of the rod is $r_1(F_1 + F_2) - (r_1 + r_2)F_2 = r_1F_1 - r_2F_2$. This is the same result we obtained for the torques about the pivot, and so the sum of the torques about the left end is zero. ✔

Exercise 12.1 shows that the sum of the torques about the left end of the rod is zero, just like the sum of the torques about the pivot. You can repeat the calculation for the torques about the right end of the rod or any other point, and each time you will find that the sum of the torques is zero. The reason is that the rod is not rotating about any point, and so the sum of the torques must be zero about any point. In general we can say:

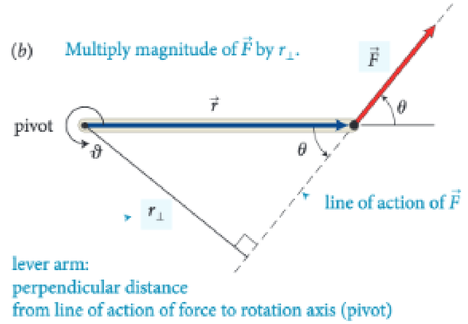
For a stationary object, the sum of the torques is zero.

For a stationary object we can choose any reference point we like to calculate torques. It pays to choose a reference point that simplifies the calculation. As you have seen, we do not need to consider any force that is exerted at the reference point. So, by putting the reference point at the point of application of a force, we can eliminate that force from the calculation.

12.2 In the situation depicted in Figure 12.2*a*, you must continue to exert a force on the seesaw to keep the child off the ground. The force you exert causes a torque on the seesaw, and yet the seesaw's rotational acceleration is zero. How can this be if torques cause objects to accelerate rotationally?

Example 12.2 Torques on lever

Three forces are exerted on the lever of Figure 12.7. Forces $\vec{F}_1$ and $\vec{F}_3$ are equal in magnitude, and the magnitude of $\vec{F}_2$ is half as great. Force $\vec{F}_1$ is horizontal, $\vec{F}_2$ and $\vec{F}_3$ are vertical, and the lever makes an angle of 45° with the horizontal. Do these forces cause the lever to rotate about the pivot? If so, in which direction?



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I don't understand how this combination of factors tells you anything about direction? Aren't magnitude and lever arm distance both scalar quantities? It seems like we would need to know some sort of direction to calculate torque. Oct 20 12:09 am

SB

I think you may be able to think about the direction separately. So, after multiplying this magnitude and distance, you can attach a sign to the torque based on the defined parameters of the system. In the following paragraph, they start to explain how to choose this direction. Oct 20 12:38 am

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Enter your comment or question and press Enter

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$\vec{F}_1$

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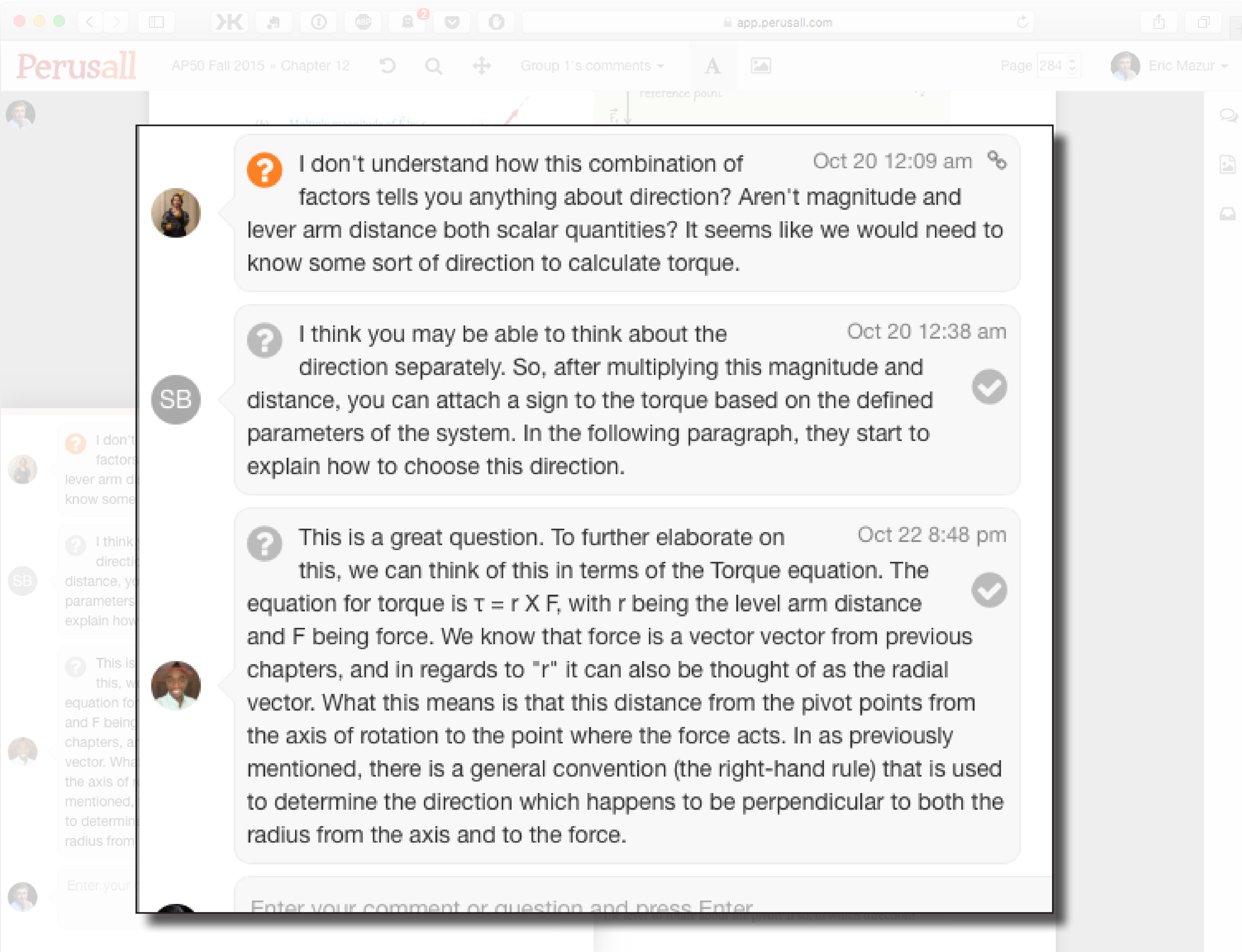
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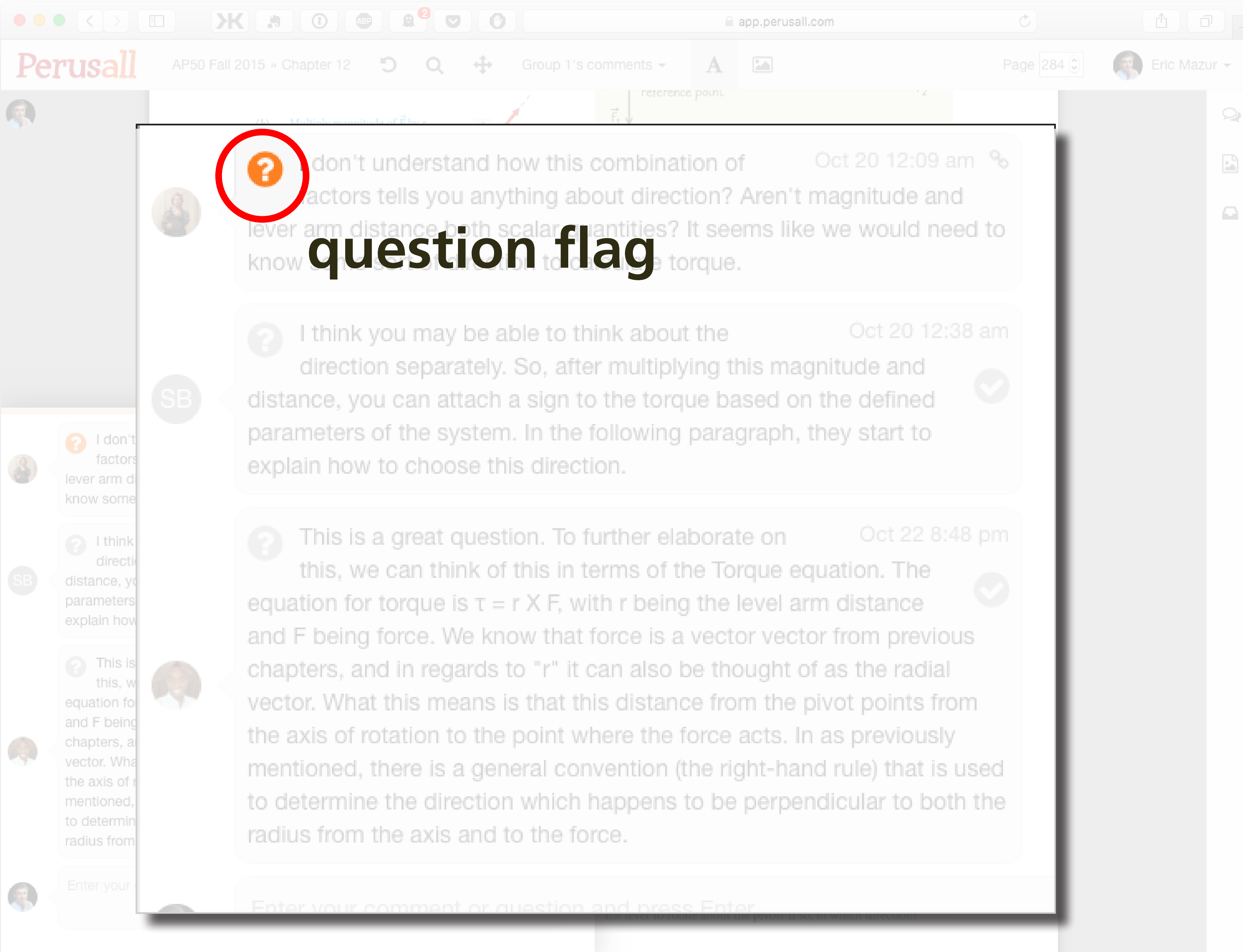

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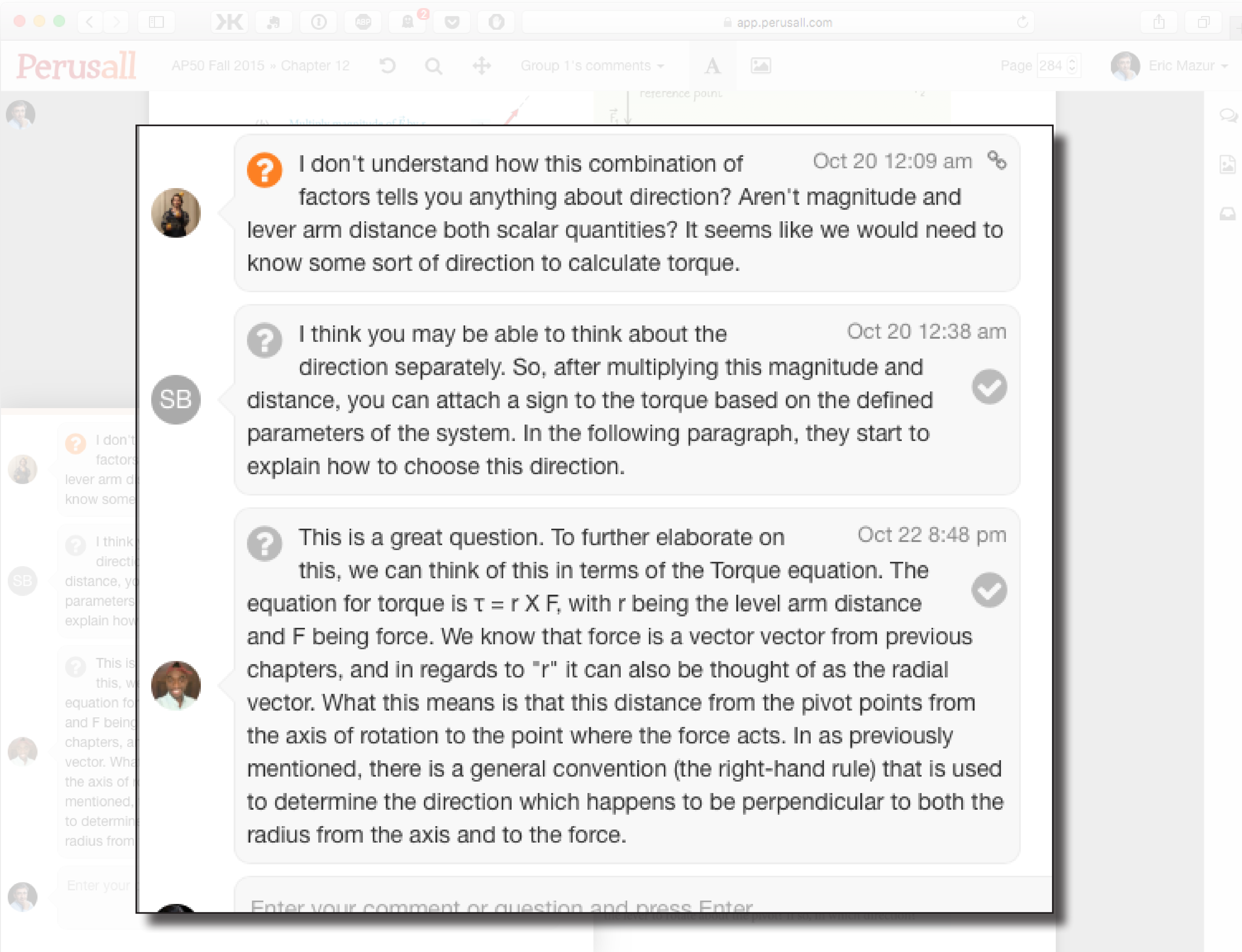
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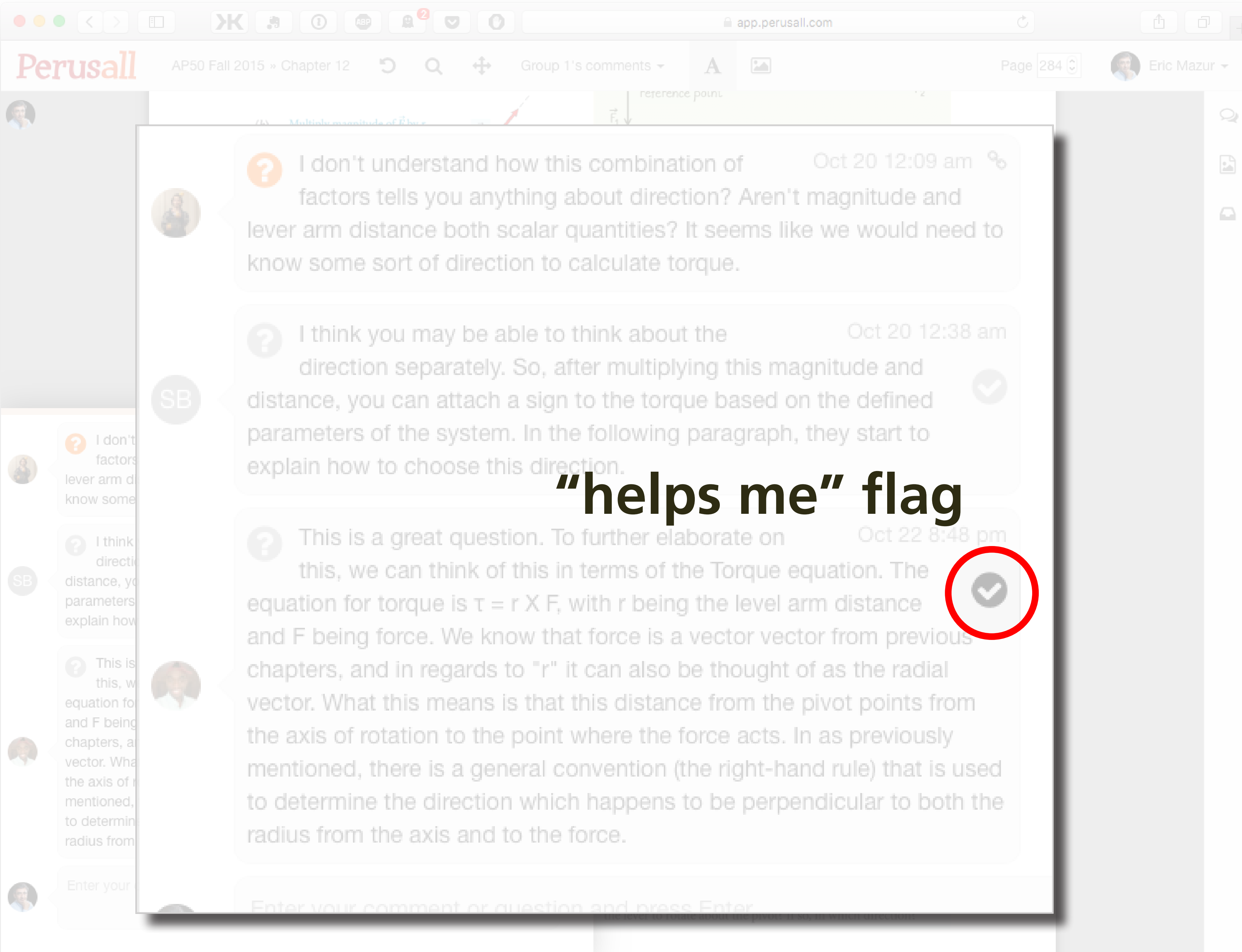

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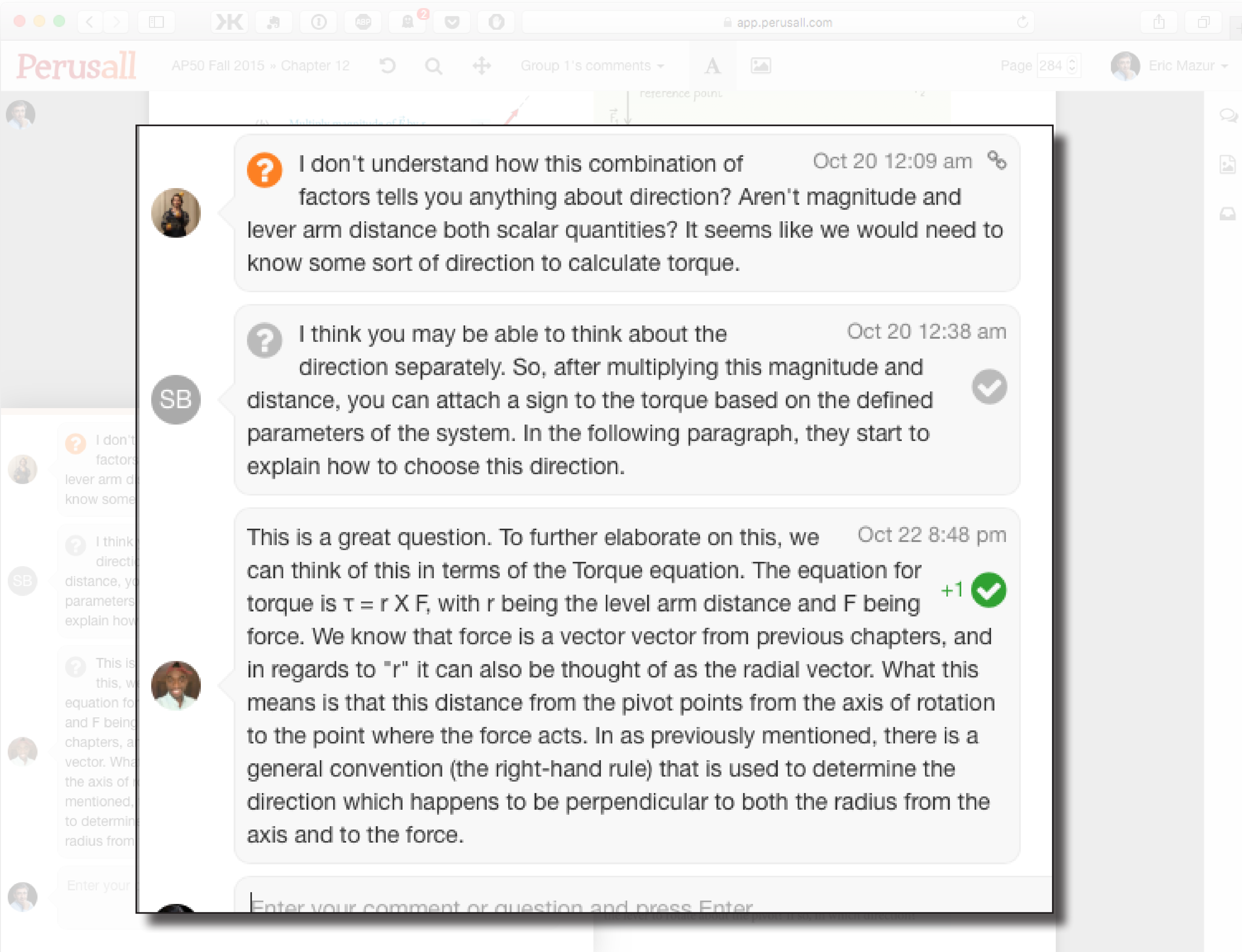
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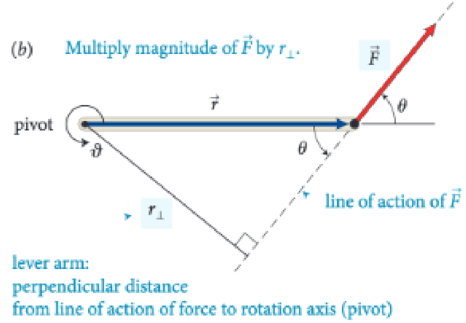

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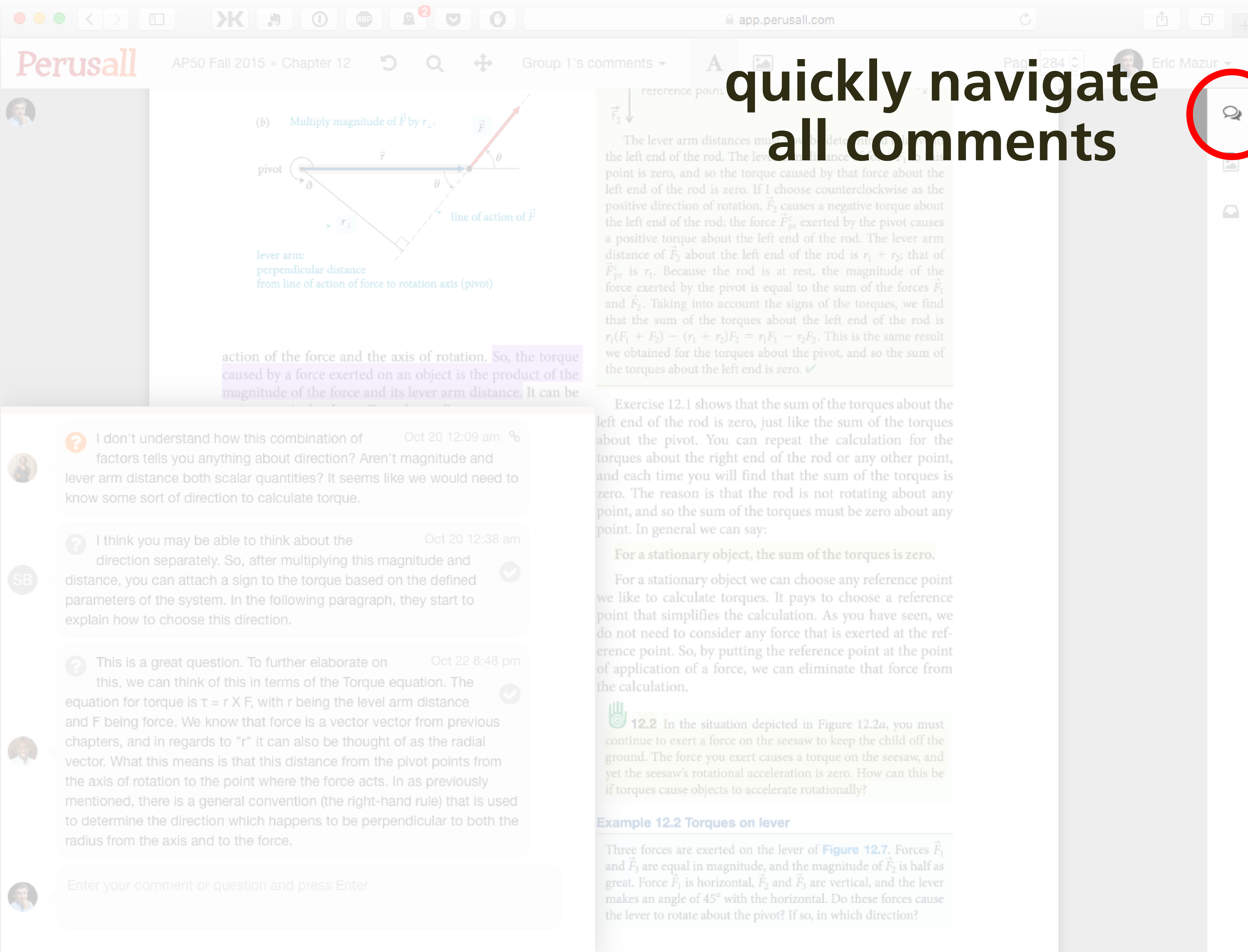

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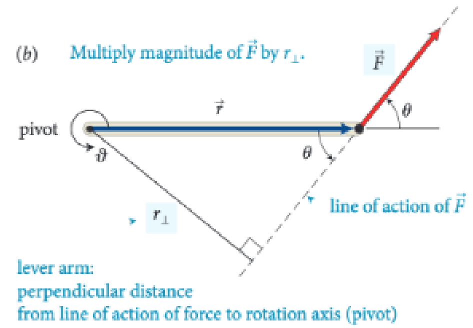

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On the very left, we see th...
It's interesting that the white ...
Is the refernece frame i... 2
How does force affect ... 2
I was curious about this, t... 3
I understand partially w... 3
In this class, we always emp...
The part before this wa... 2
The extended free-body d... 4
This just means the net... 3
I don't understand why ... 3
It is important to note that... 2
This reminds me of when we ...
Torque is the ability of a forc...
The type of diagram to use d...
It sounds like it is sayin... 3
So then do we have a p... 5
Since torque is the cross pro...
The right-hand rule can al... 3
I don't understand how ... 3
Orientation-based descriptio...
I don't really understan... 2
How small is small? As ... 3
I think it would be slightly ...
While I believe I underst... 3
(a) The change in rotationa...
As we saw earlier in the chap...
Objects executing motion ar...
Generally, for rotating bod... 2
Does torque have the s... 3

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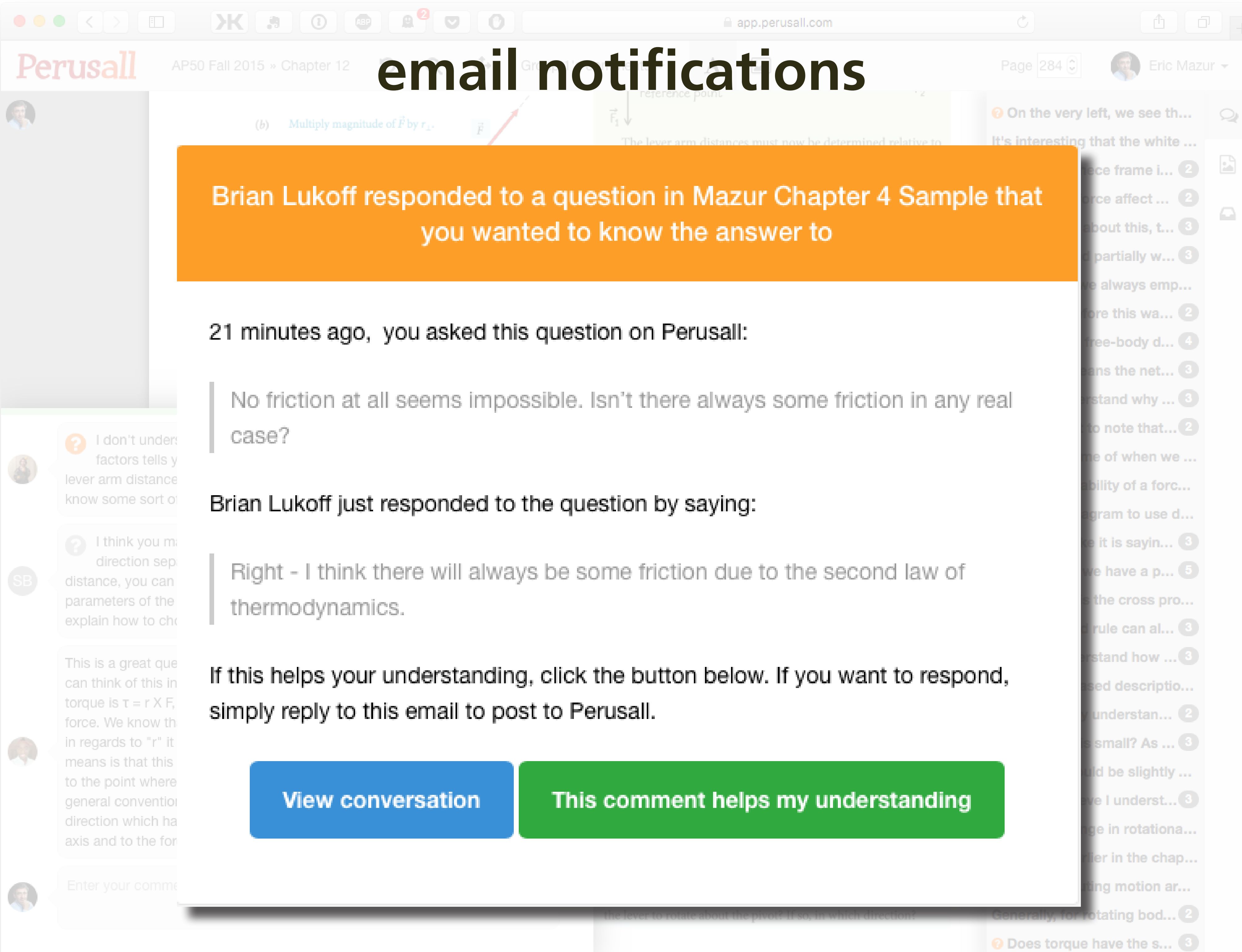

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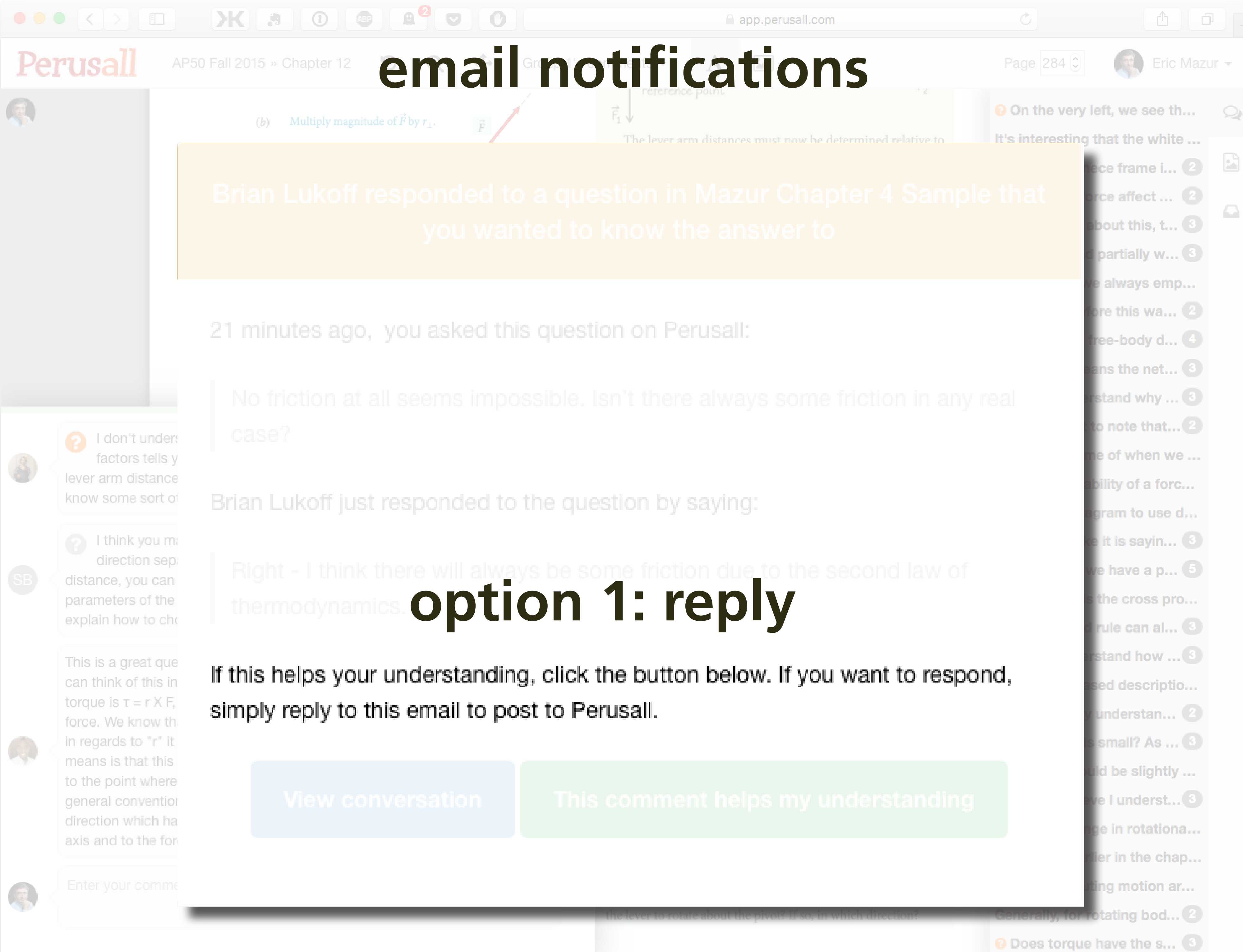

option 1: reply

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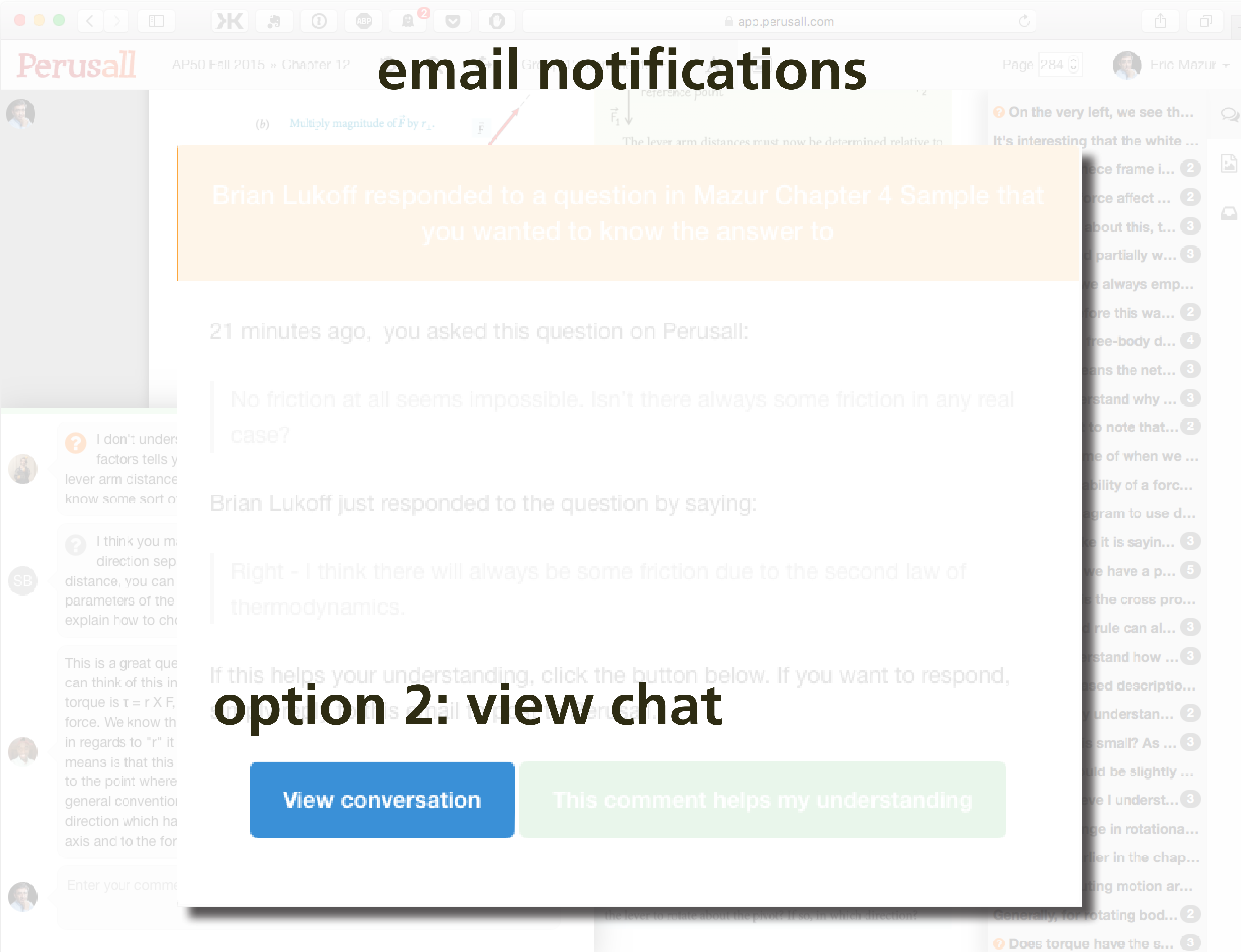

option 2: view chat

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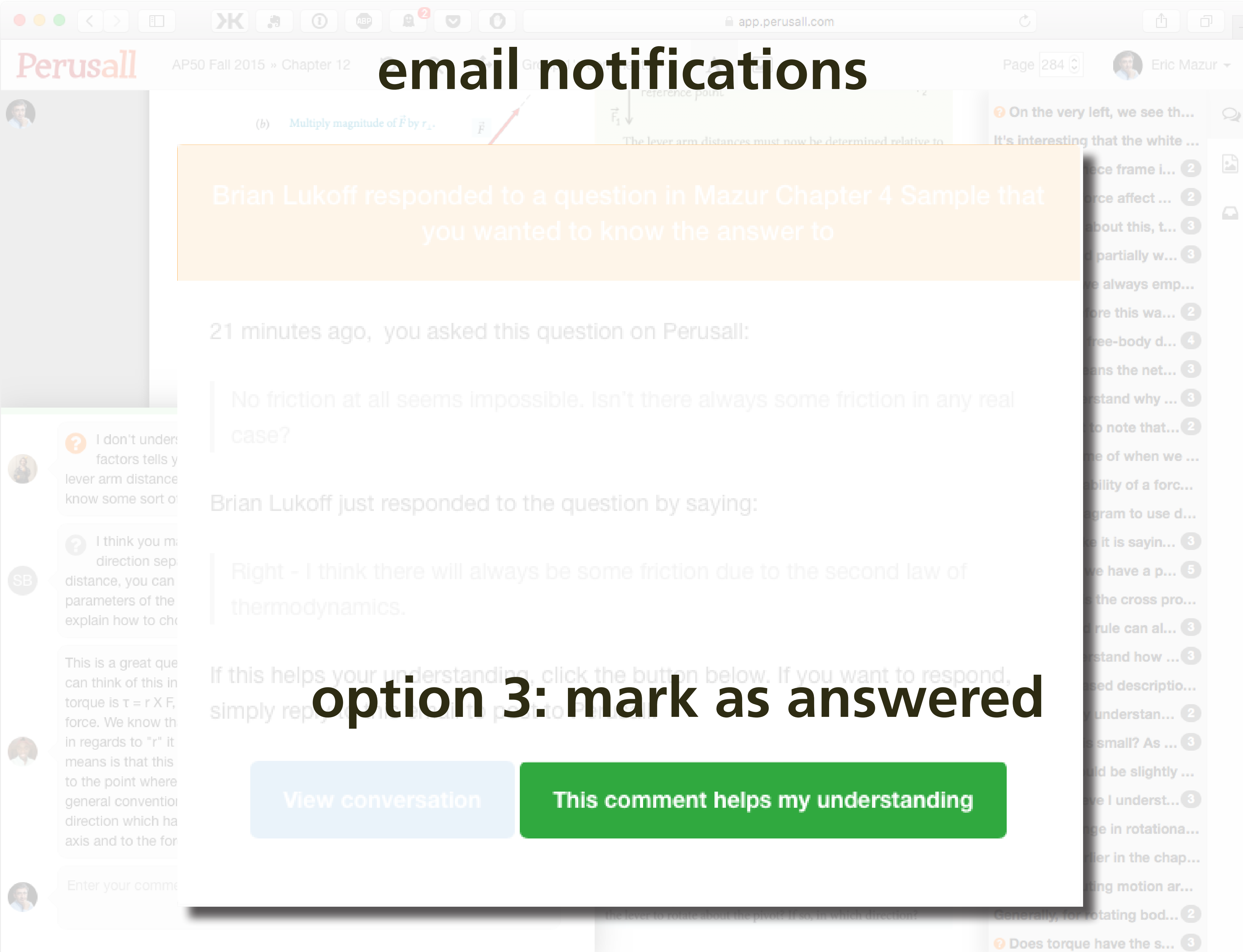
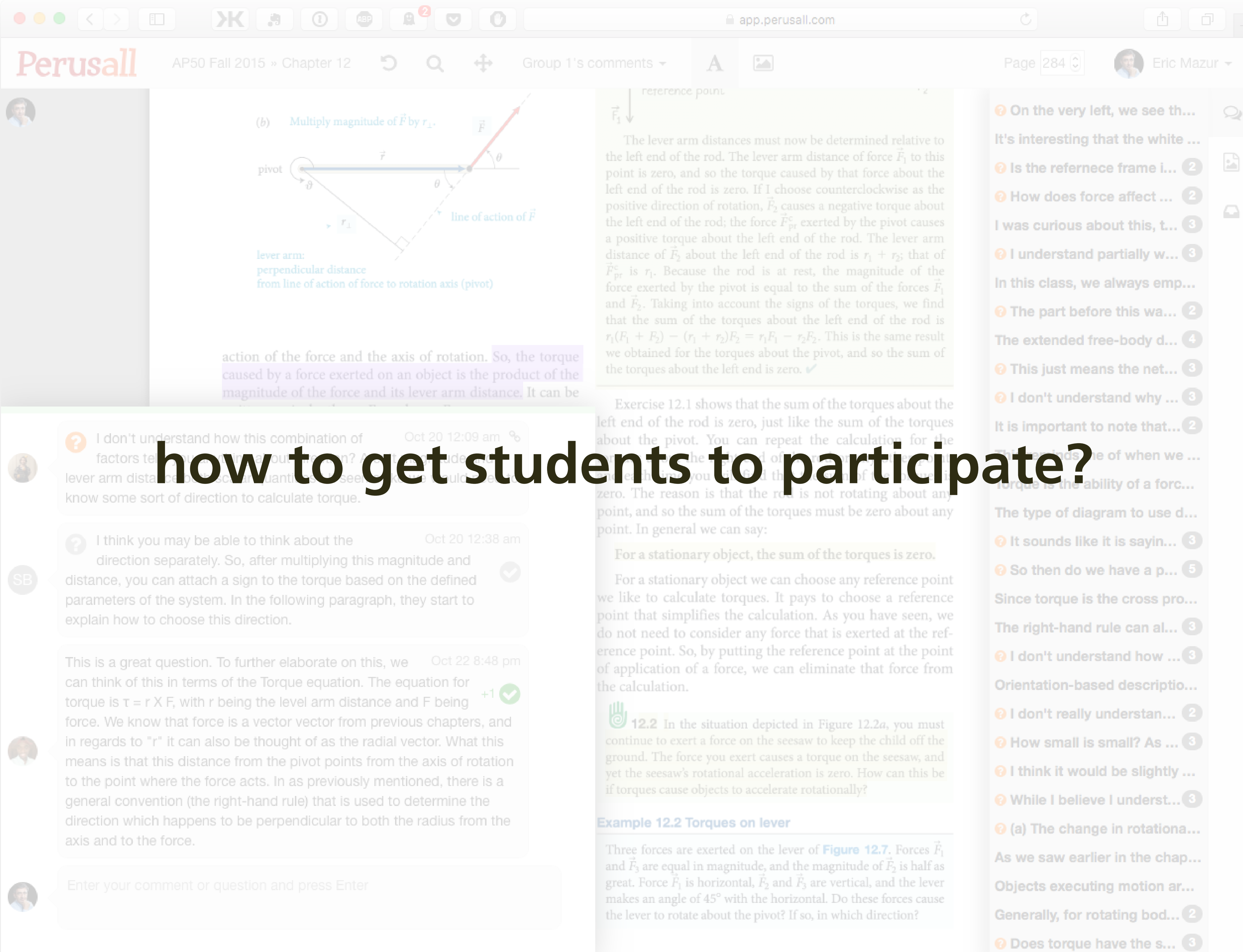
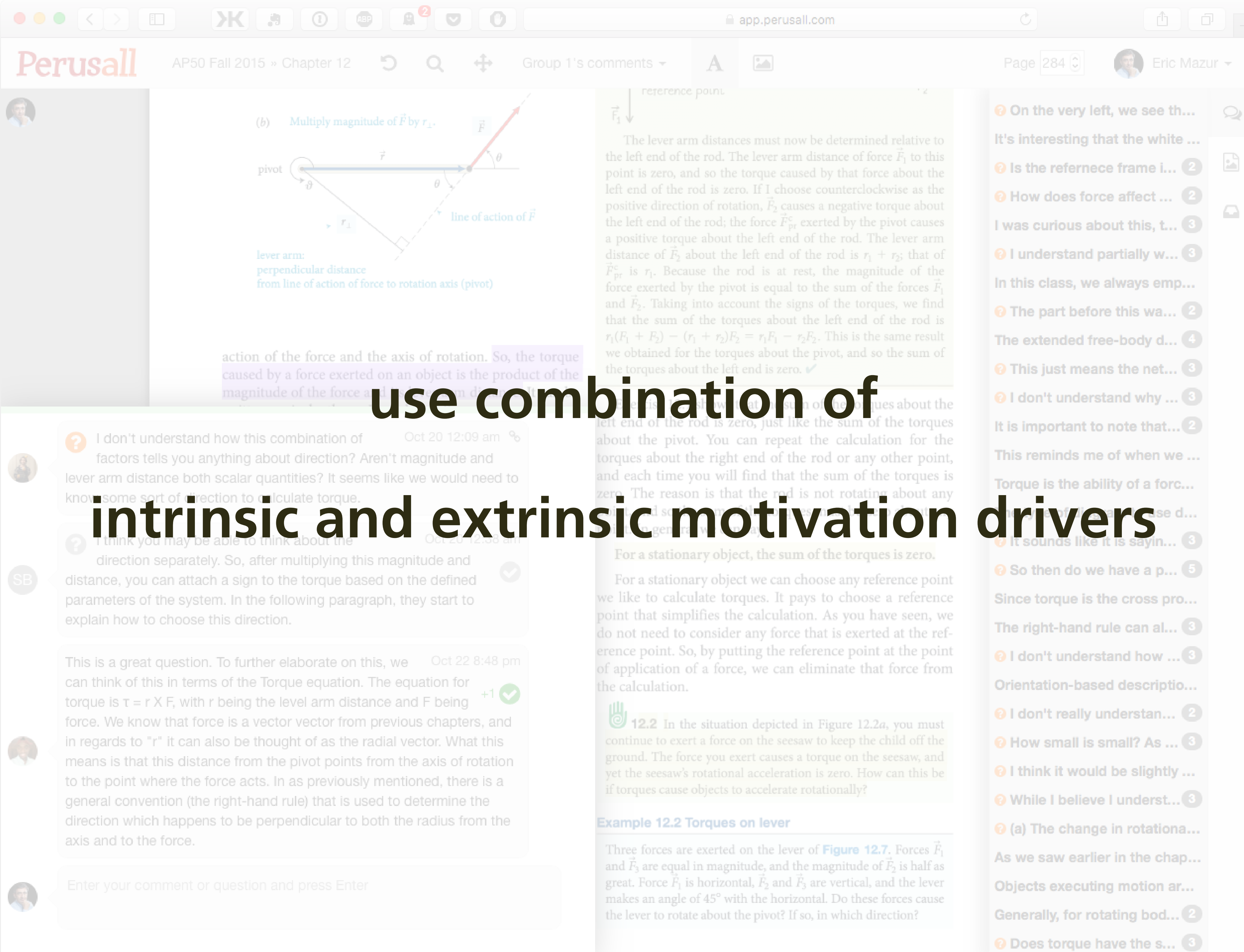


option 3: mark as answered

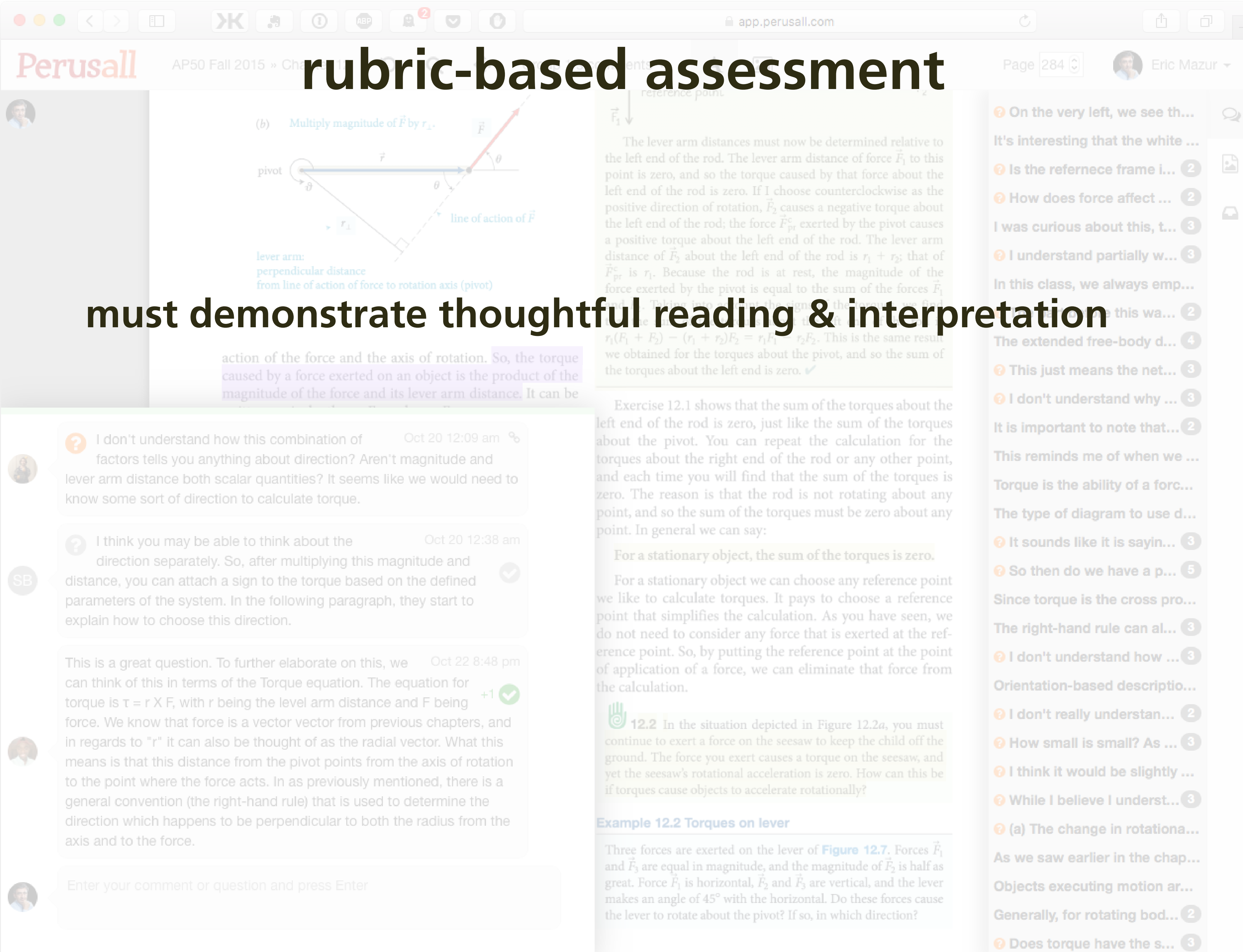
how to get students to participate?



use combination of intrinsic and extrinsic motivation drivers



rubric-based assessment



must demonstrate thoughtful reading & interpretation

rubric-based assessment

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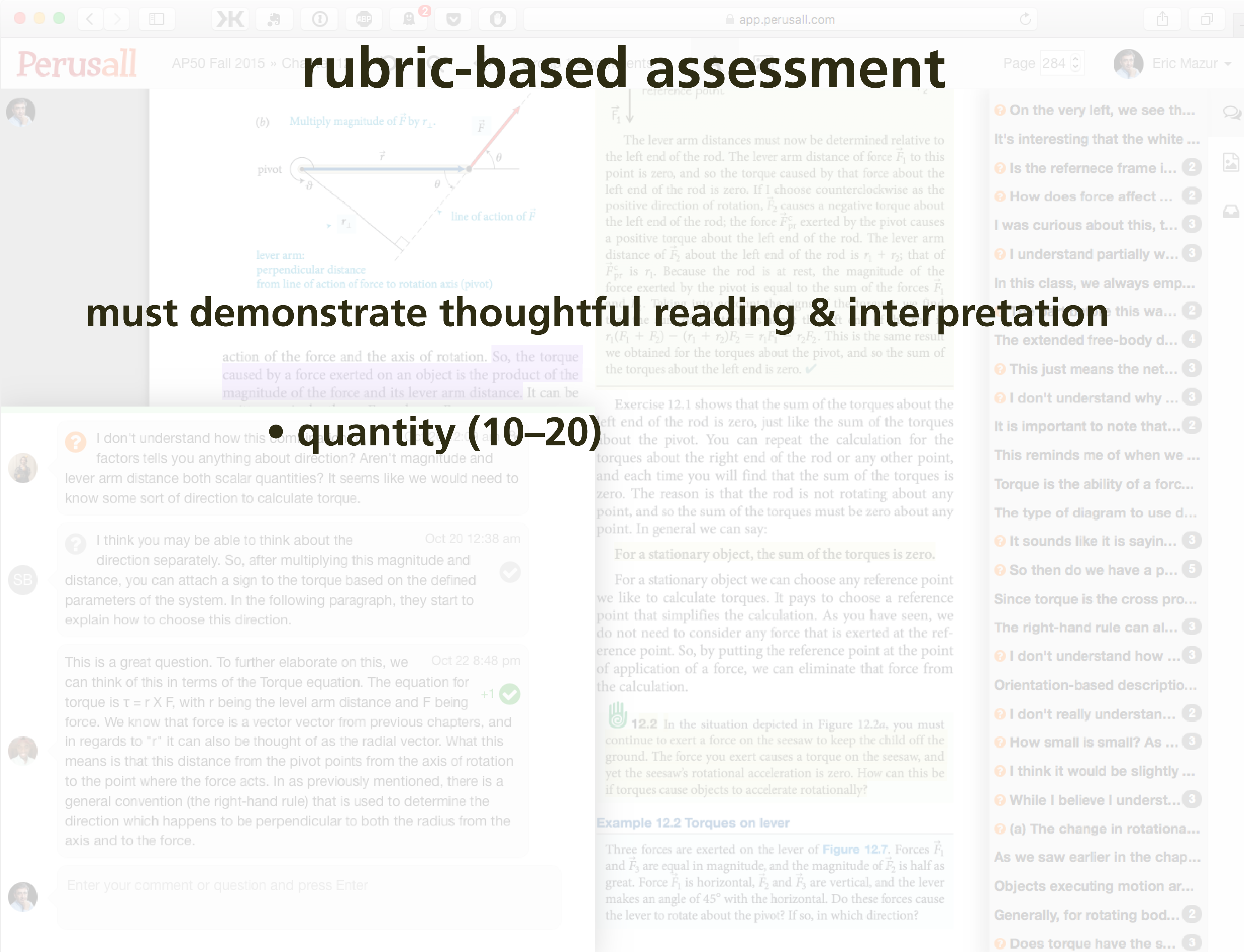
- quantity (10–20)



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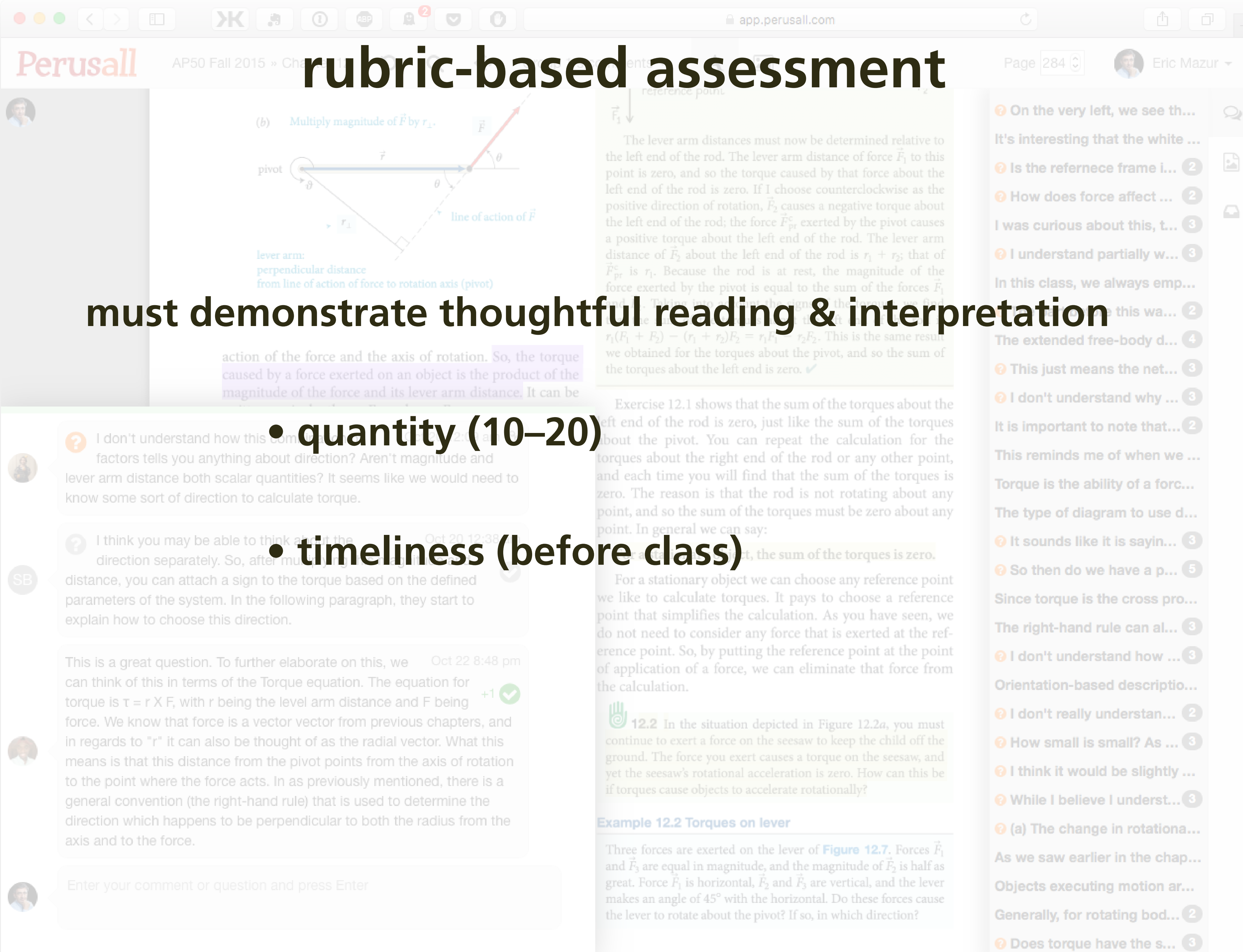
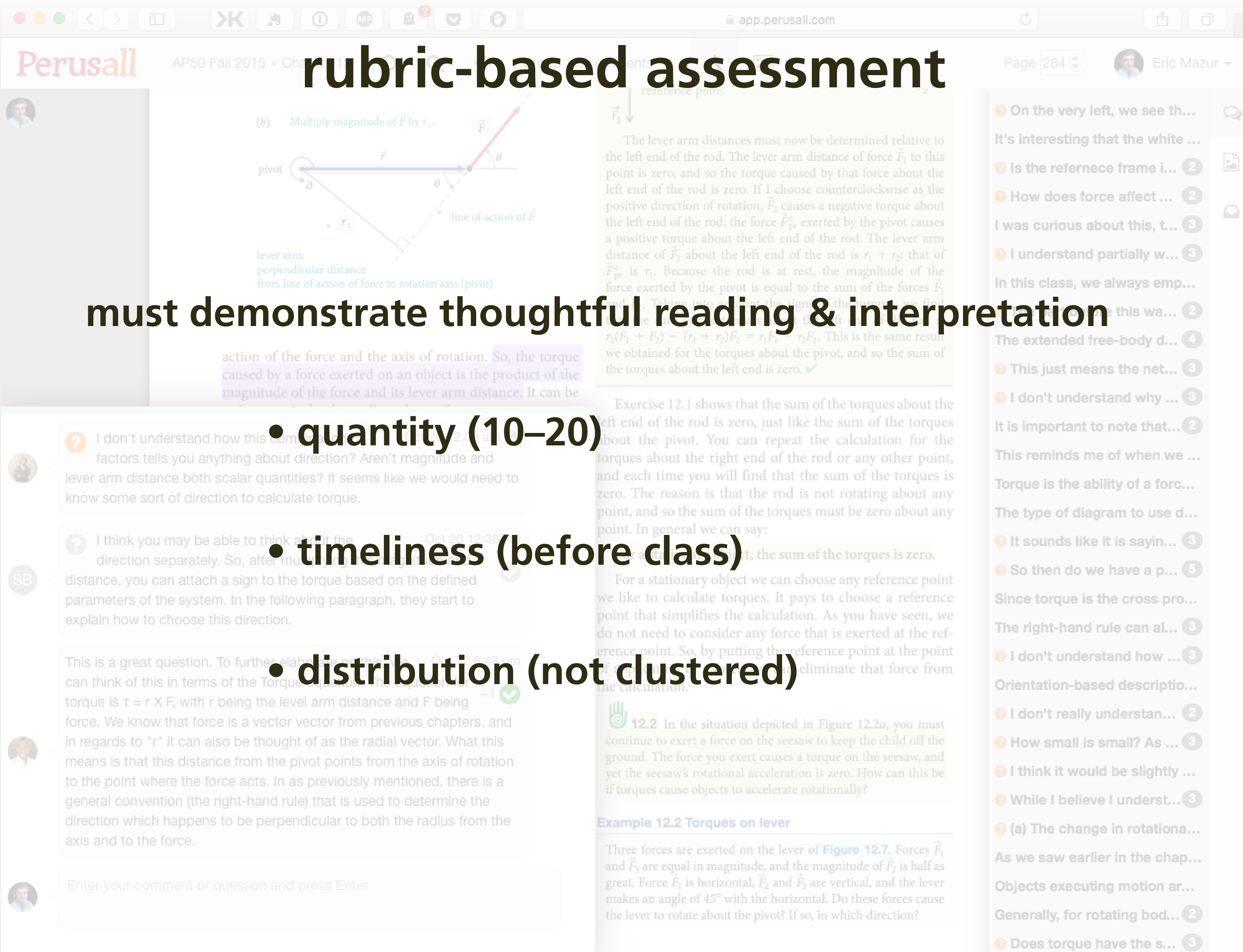


must demonstrate thoughtful reading & interpretation

- quantity (10–20)
- timeliness (before class)



rubric-based assessment

must demonstrate thoughtful reading & interpretation

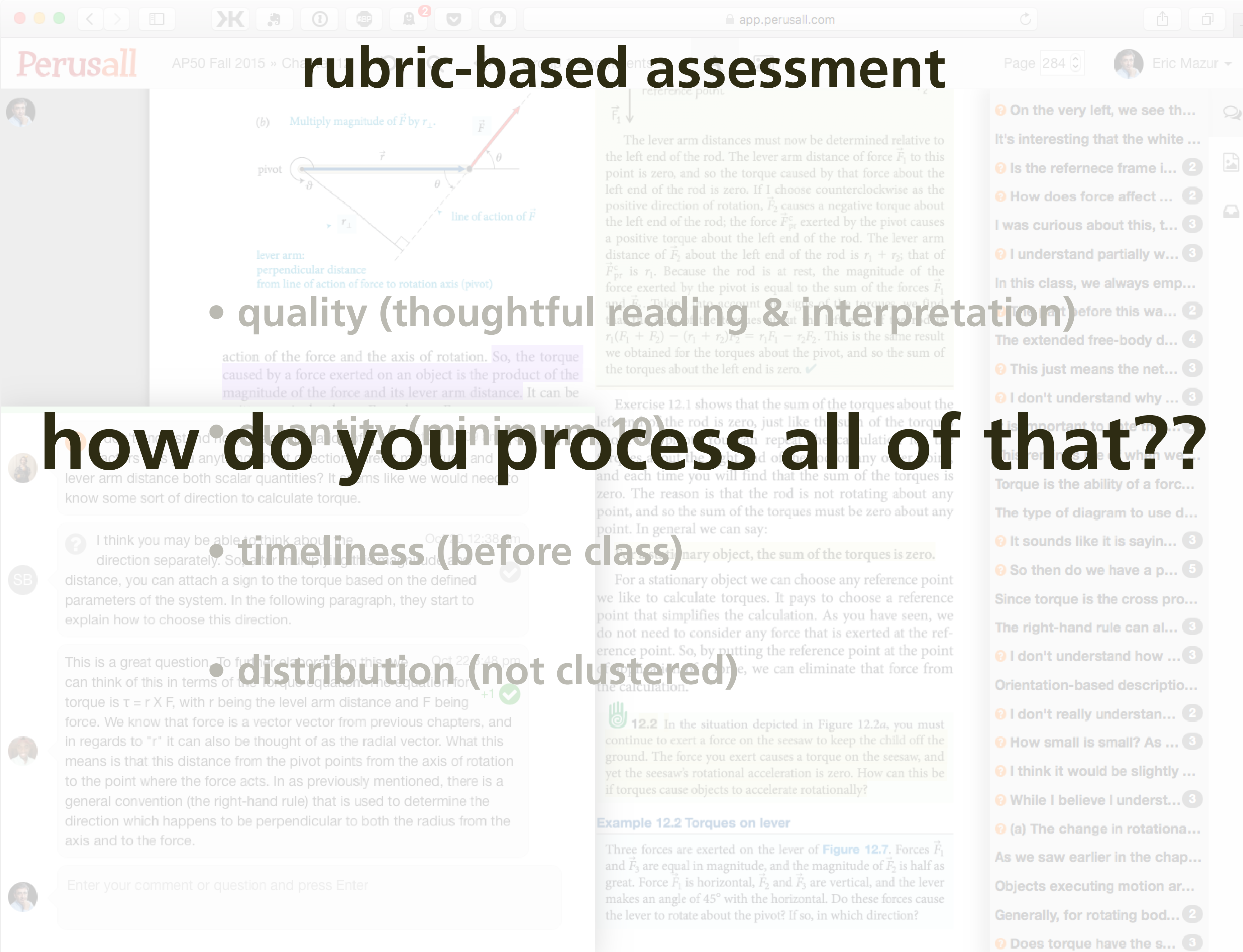
- quantity (10–20)
- timeliness (before class)
- distribution (not clustered)

rubric-based assessment

- quality (thoughtful reading & interpretation)
- quantity (minimum ...)
- timeliness (before class)
- distribution (not clustered)

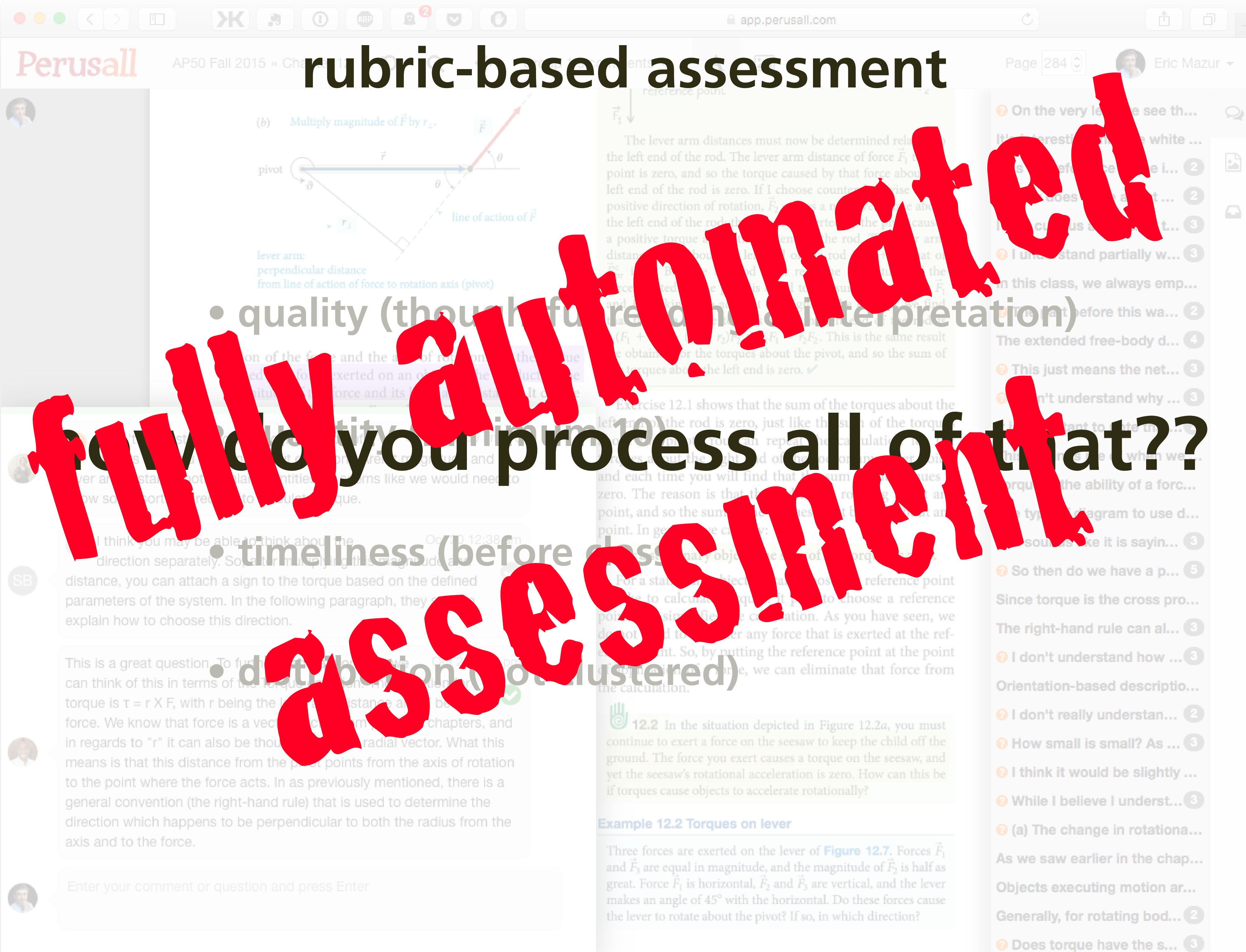
over 20,000 annotations!

rubric-based assessment



- quality (thoughtful reading & interpretation)
- quantity (minimum 10)
- timeliness (before class)
- distribution (not clustered)

how do you process all of that??


rubric-based assessment
• quality (thoughtful interpretation)
How do you process all of that??
• timeliness (before class)
• distribution (not clustered)
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assessment
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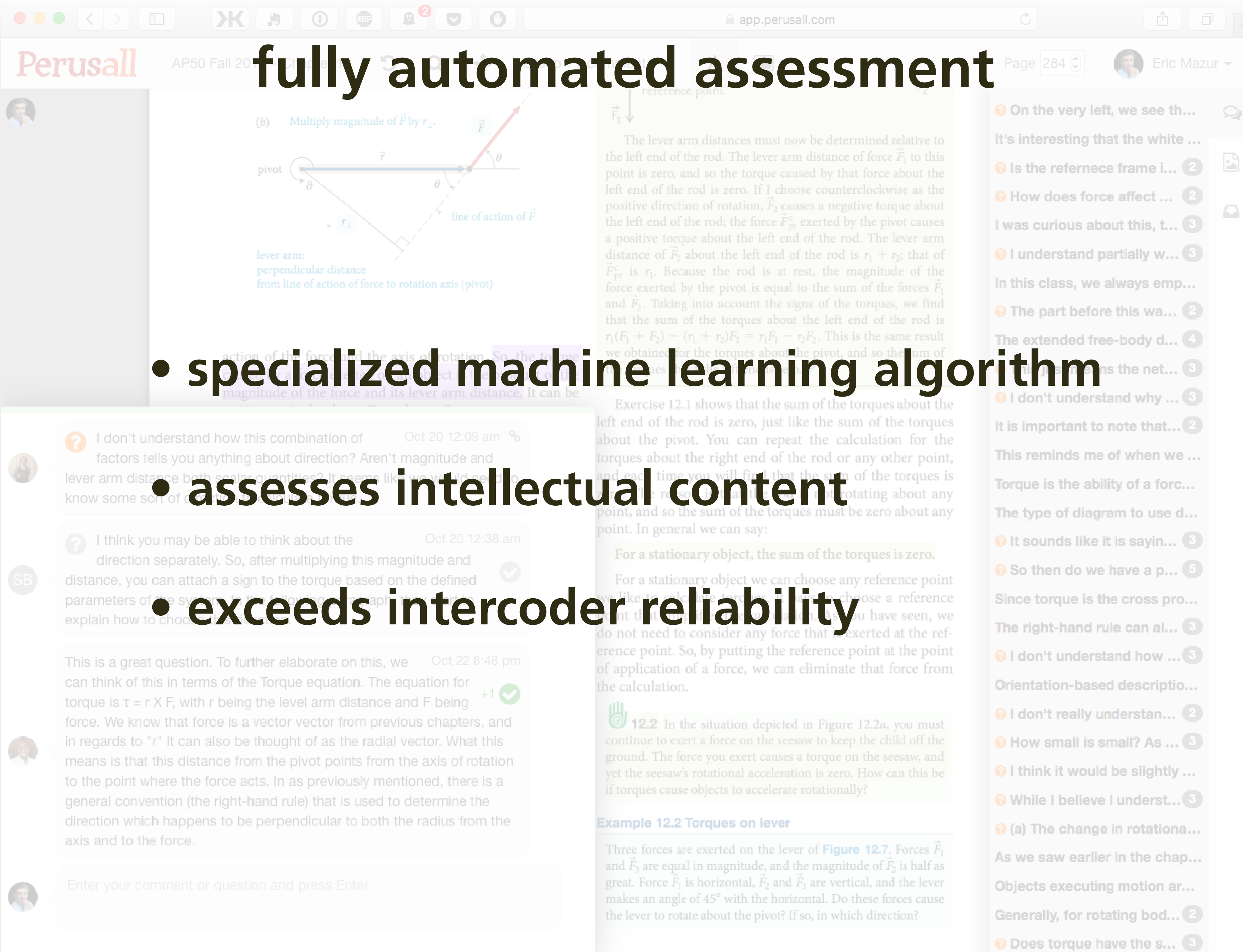
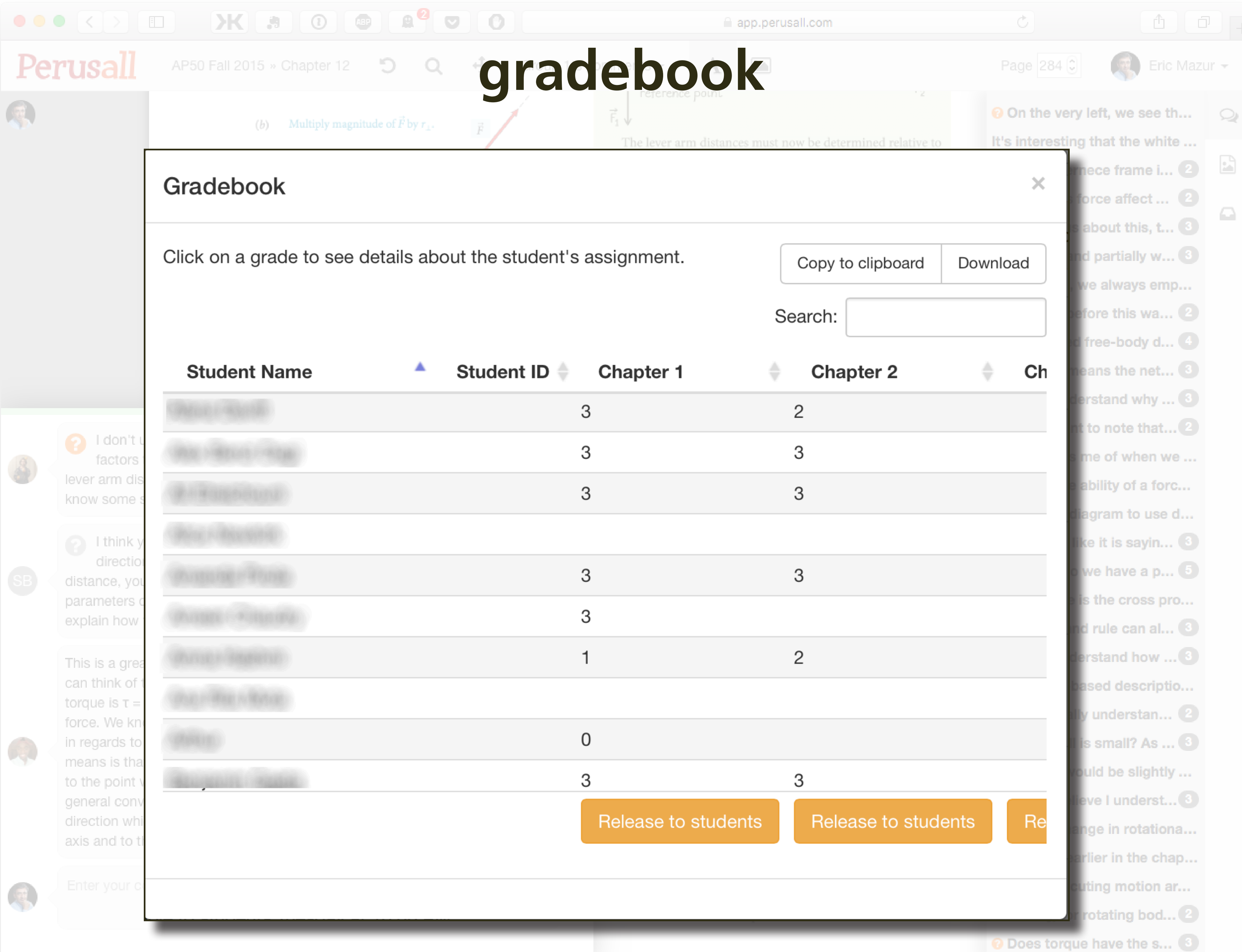
fully automated assessment

- specialized machine learning algorithm
- assesses intellectual content
- exceeds intercoder reliability



gradebook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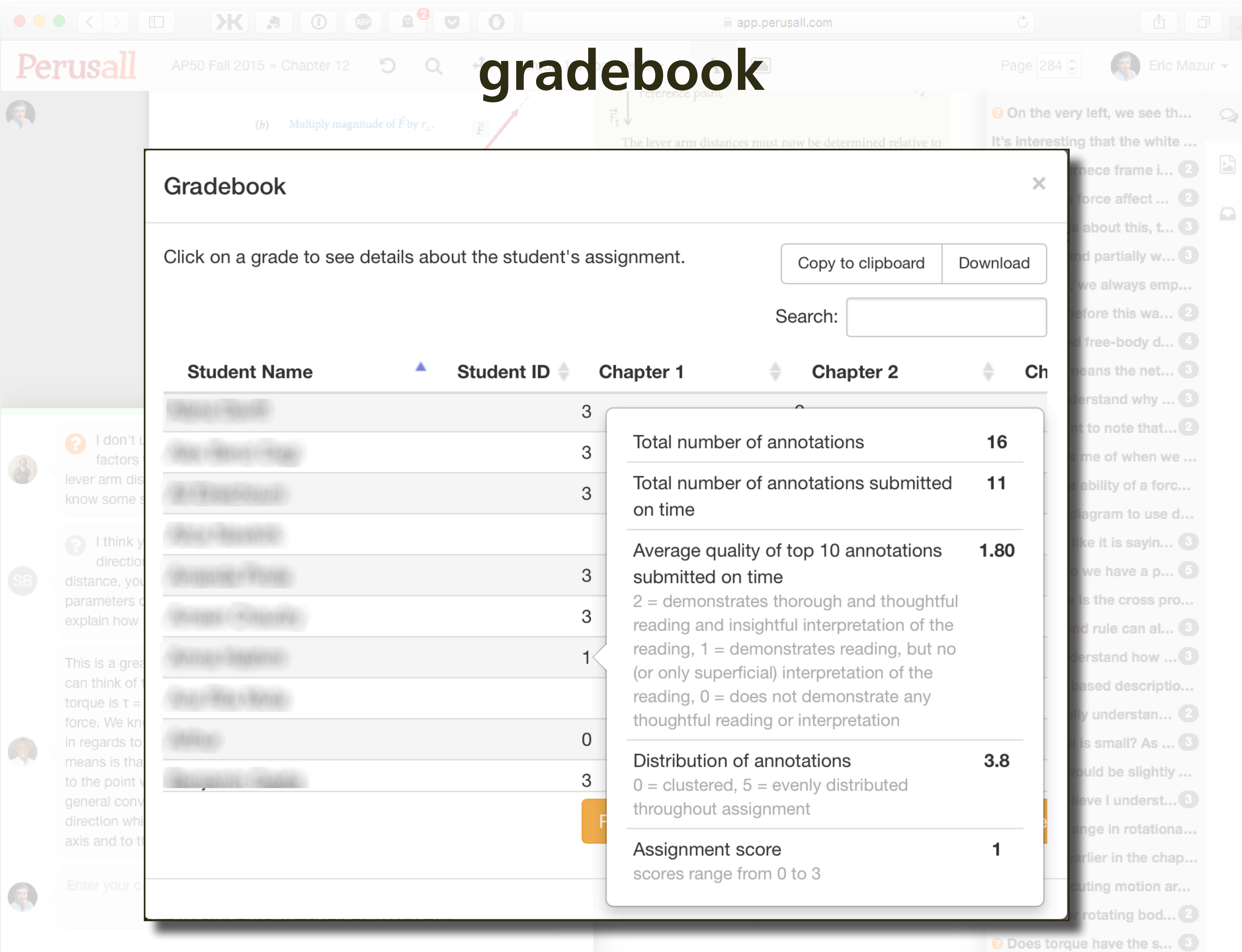

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Chapter 2
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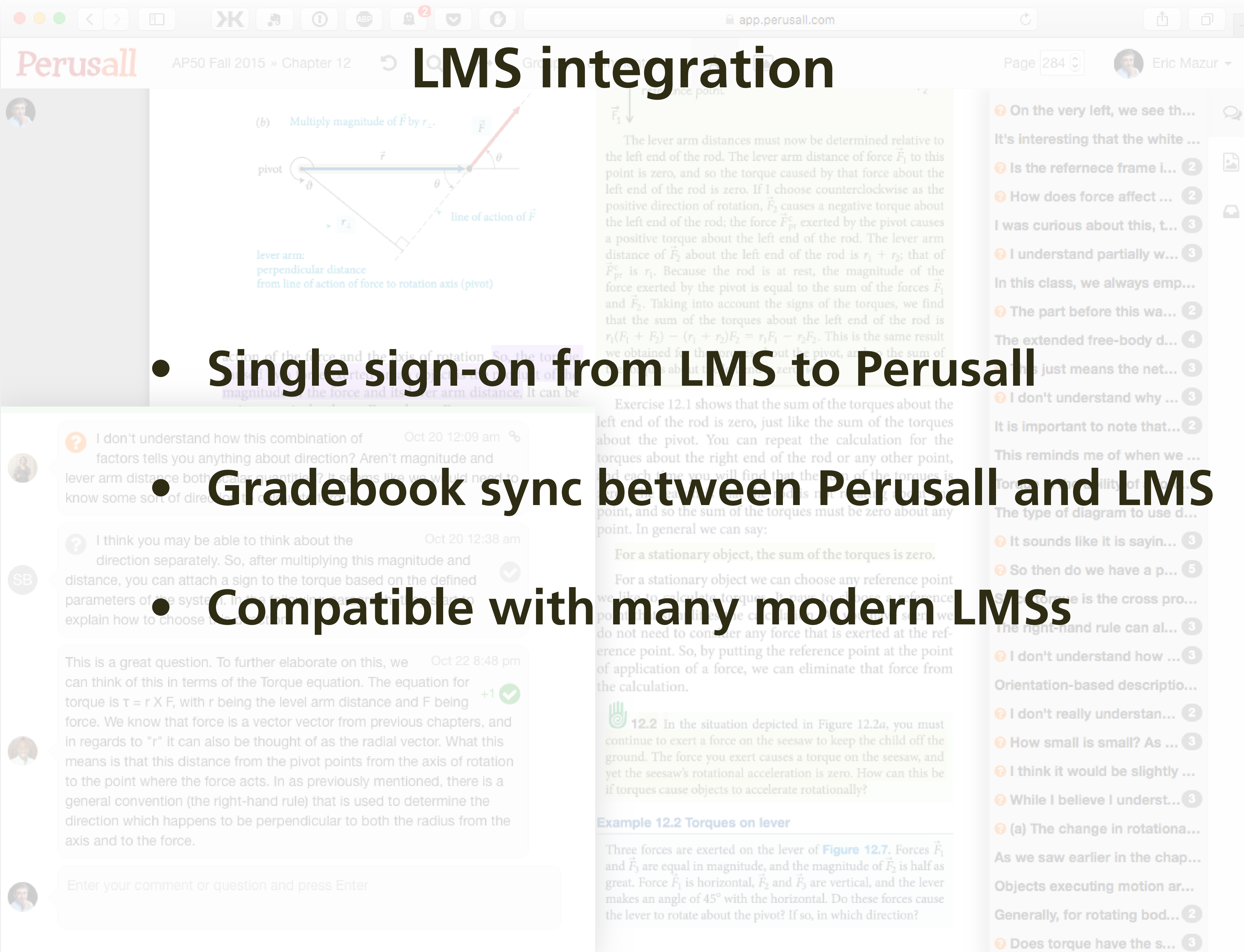
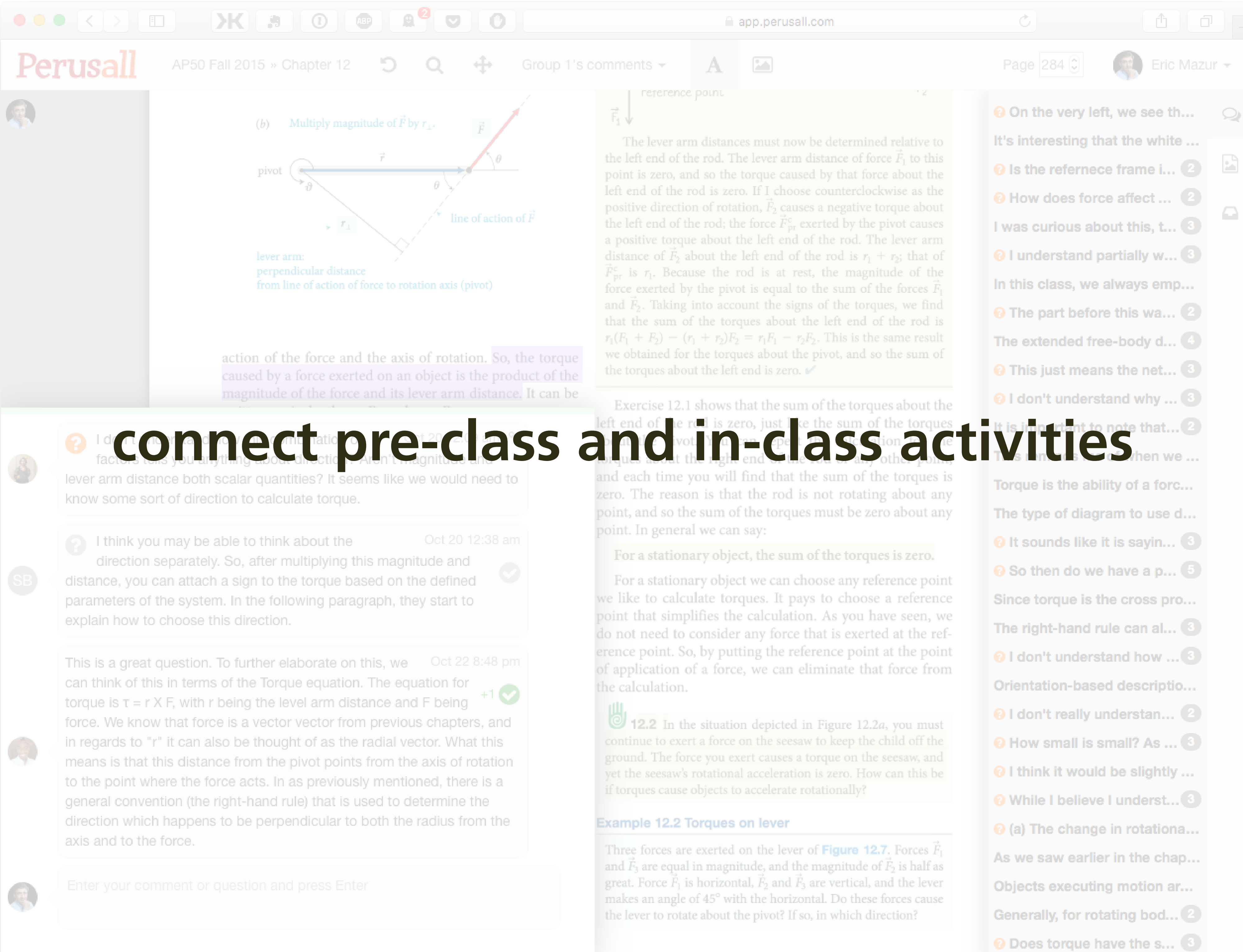
3
3
3
1
0
3
Total number of annotations 16
Total number of annotations submitted on time 11
Average quality of top 10 annotations submitted on time 1.80
2 = demonstrates thorough and thoughtful reading and insightful interpretation of the reading, 1 = demonstrates reading, but no (or only superficial) interpretation of the reading, 0 = does not demonstrate any thoughtful reading or interpretation
Distribution of annotations 3.8
0 = clustered, 5 = evenly distributed throughout assignment
Assignment score 1
scores range from 0 to 3

LMS integration

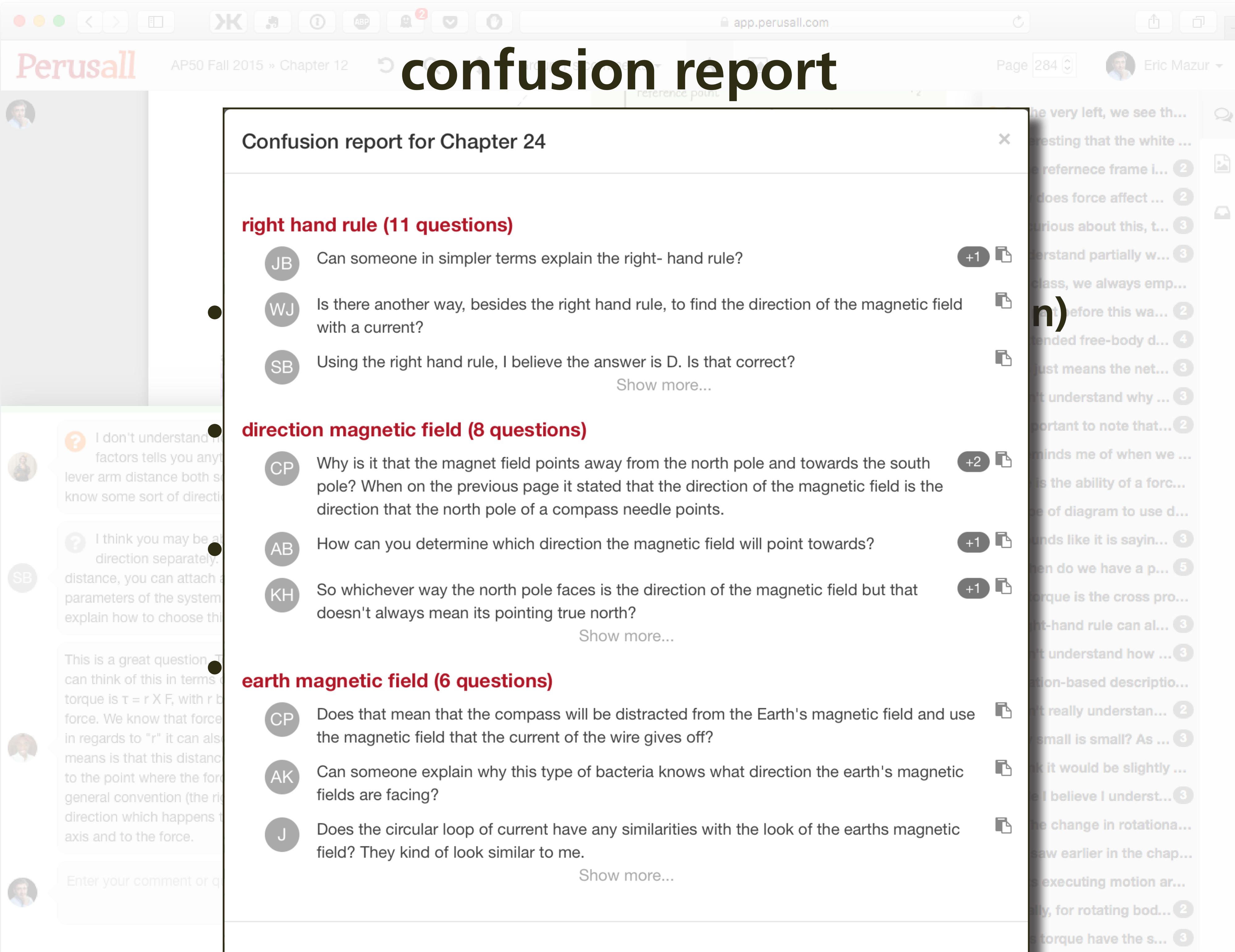


- Single sign-on from LMS to Perusall
- Gradebook sync between Perusall and LMS
- Compatible with many modern LMSs



connect pre-class and in-class activities

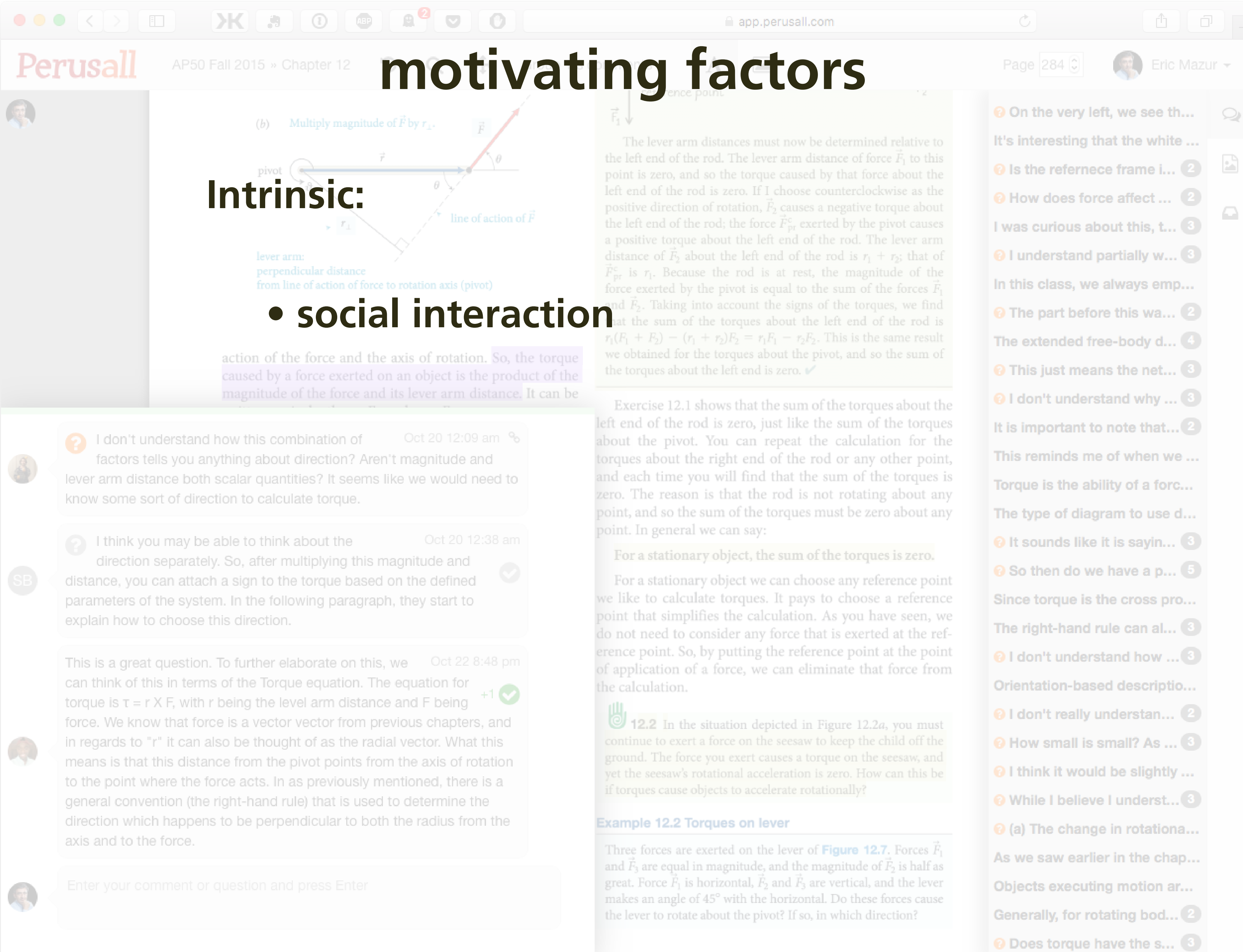
confusion report



motivating factors

Intrinsic:

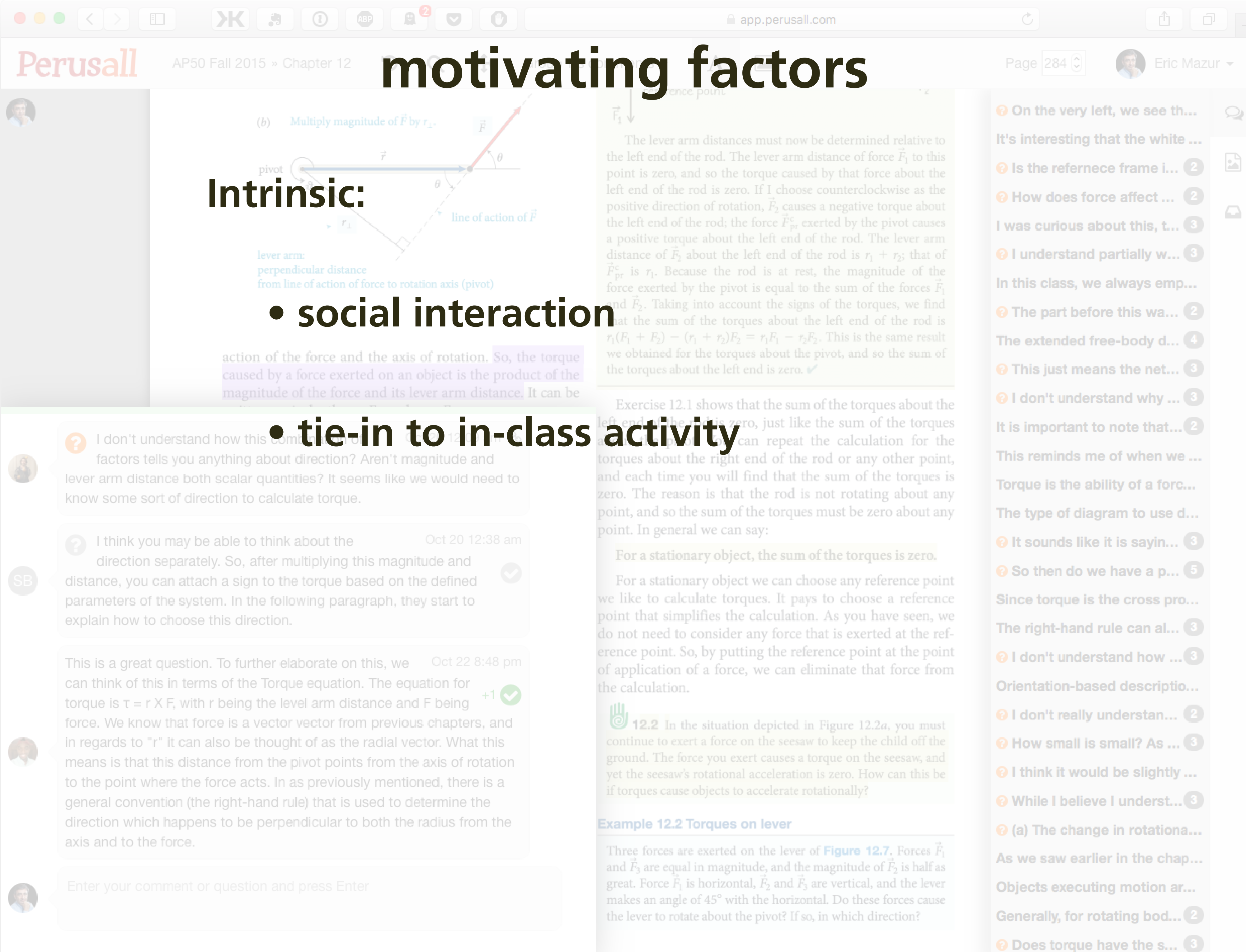
- social interaction



motivating factors

Intrinsic:

- social interaction
- tie-in to in-class activity



motivating factors

Intrinsic:

- social interaction
- tie-in to in-class activity

Extrinsic:

- assessment (fully automated)

motivating factors

"I think the Perusall app and annotation system is way better than just reading a text-book normally… I've been reading for almost four hours now and haven't gotten bored"

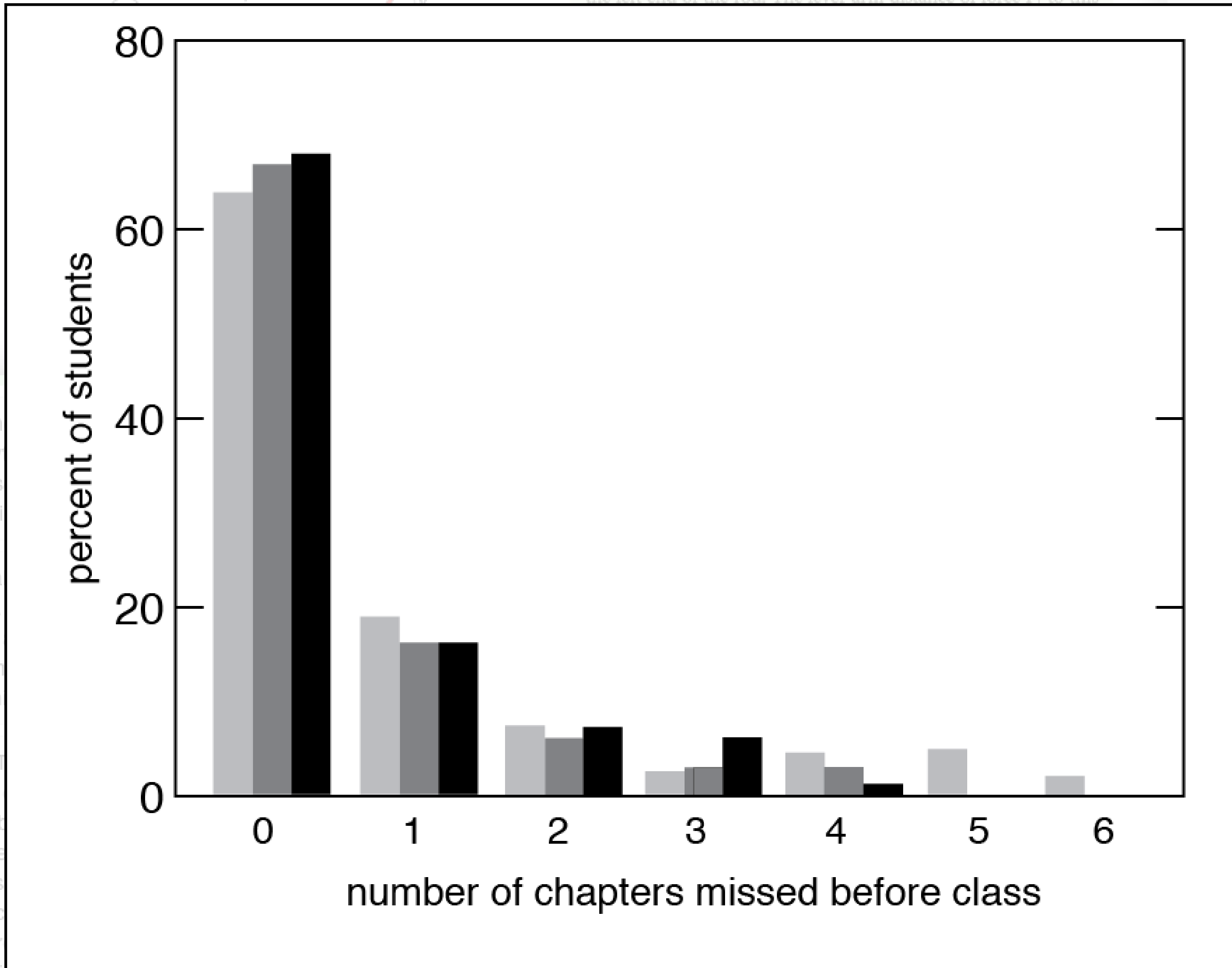
Harvard student

motivating factors

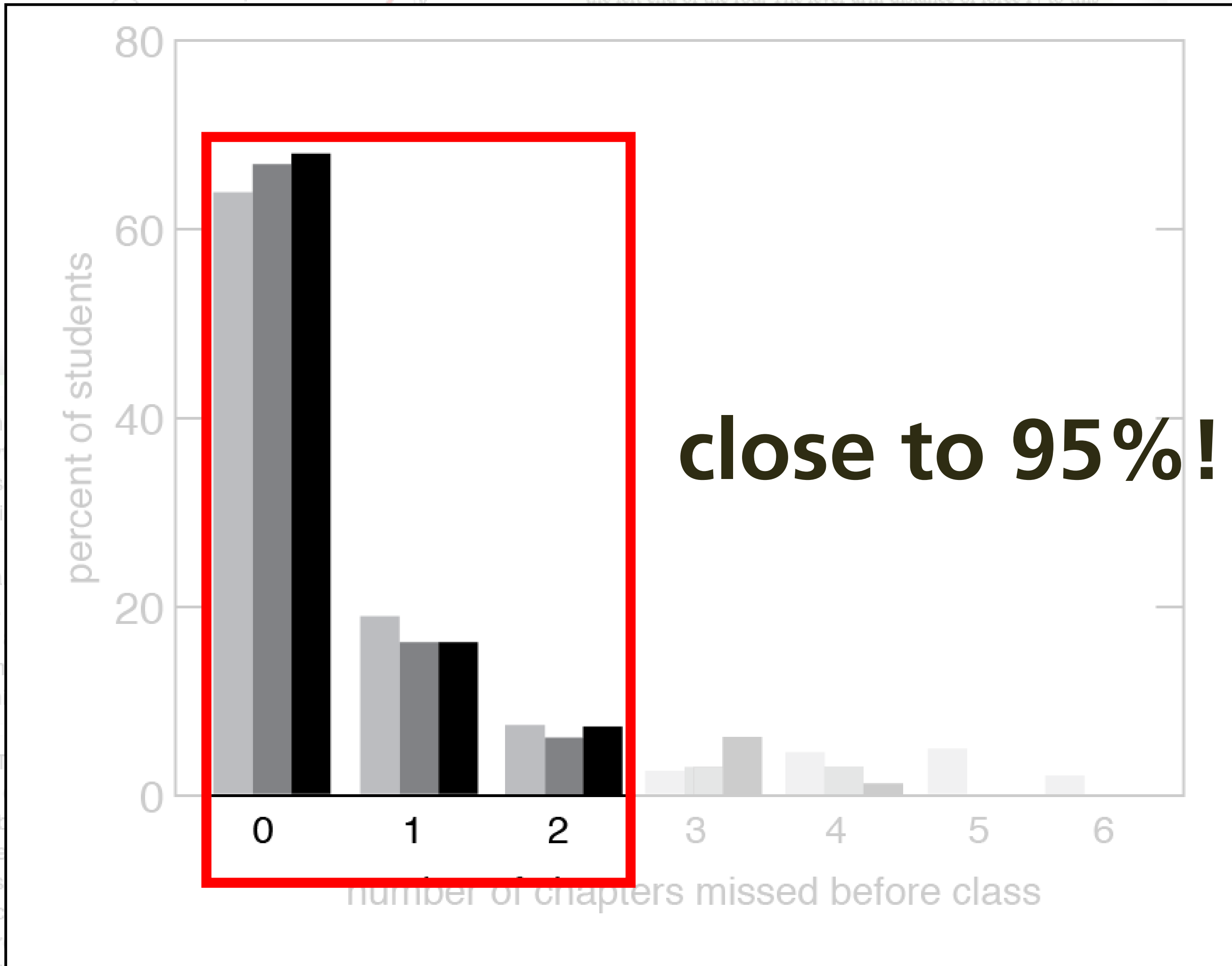
"It makes the book fun to read… All the other students on my floor are disappointed their Prof isn't using Perusall because they don't read the book."

Ohio State student

class test results

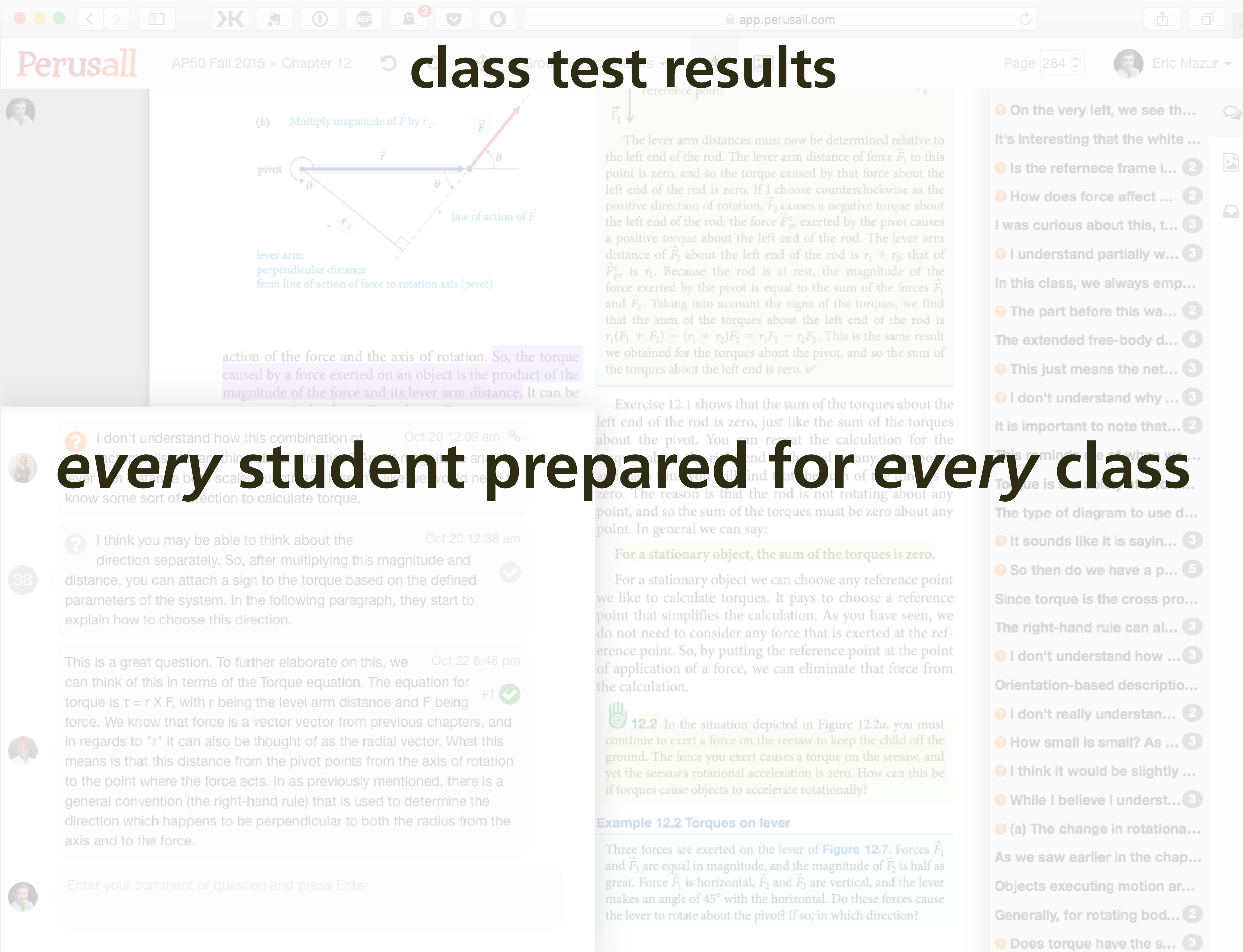


class test results



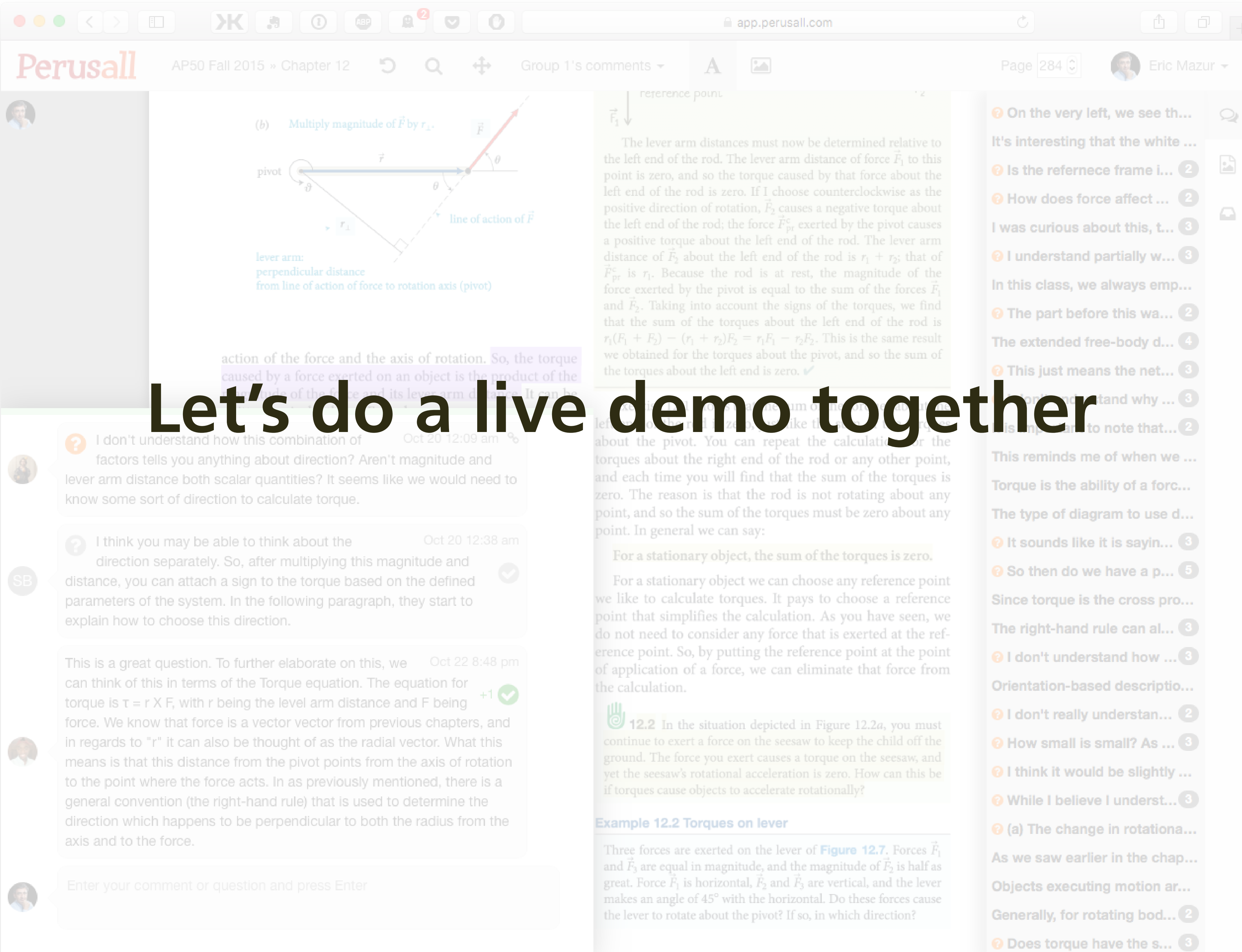
close to 95%!

class test results



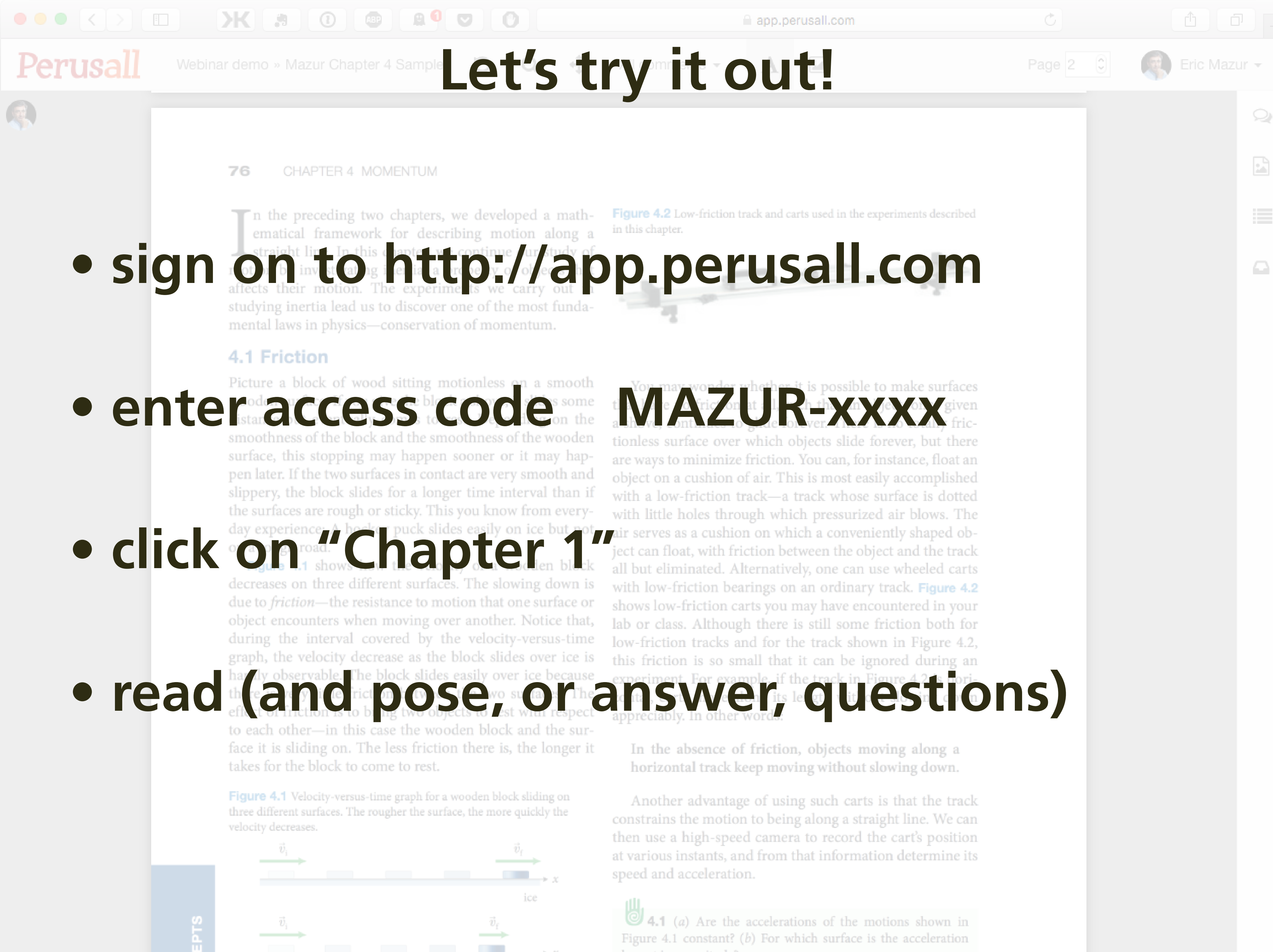
every student prepared for *every* class

Let's do a live demo together



Let's try it out!

- sign on to http://app.perusall.com
- enter access code MAZUR-xxxx
- click on "Chapter 1"
- read (and pose, or answer, questions)



Benefits

- virtually 100% completion of assignments
- improved use of class time

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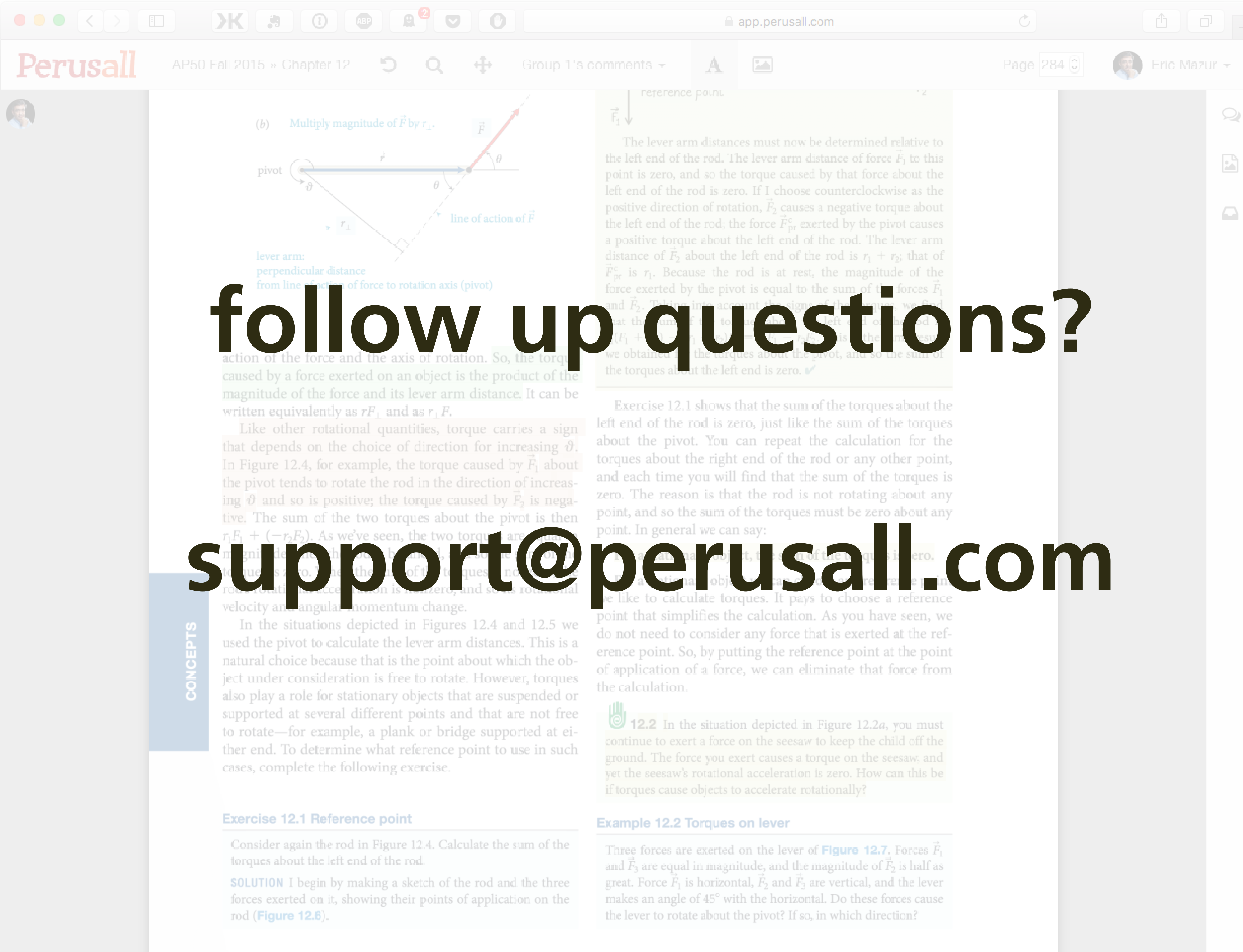
- virtually 100% completion of assignments
- improved use of class time

all at no cost & without additional instructor effort!



follow up questions?

support@perusall.com