Lightboard Videos

for a Flipped Classroom

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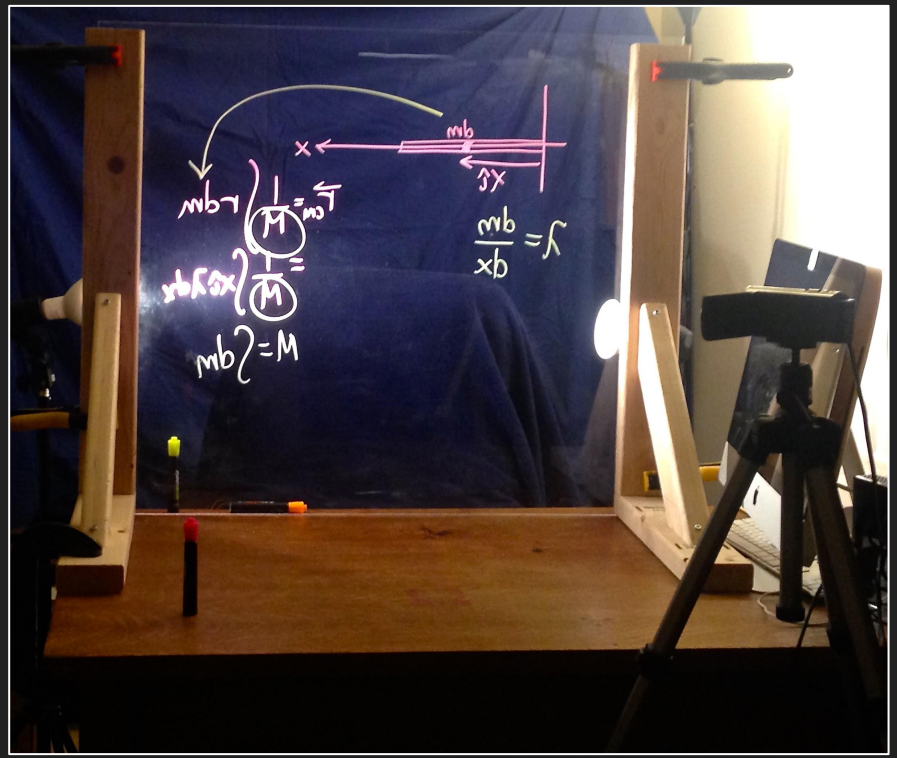
Lightboard Elements

- Plexiglass screen
- Neon markers
- Black background
- Lighting on glass
- Video flipped and cropped in post



Think about a skill you're really good at – How did you become good at it?

A. Trial and error
B. Apprenticeship
C. Attending lectures
D. Practicing

Is the learning environment:

Passive	Active
Yes-or-no questions	Challenging questions, require critical thought
Students copy notes automatically	Student notes build on an outline
Questions answered immediately by instructor	Questions used to motivate discussion
Students work and think in isolation	Peer collaboration encourages reflection and engagement

from Timothy Slater's "First Steps Toward Increasing Student Engagement During Lecture"

Activity During Class Time

“...increased student attendance, higher engagement, and more than twice the learning in the section taught using research-based instruction.”

Research-based instruction is when students actively practice physics (rather than just listening)

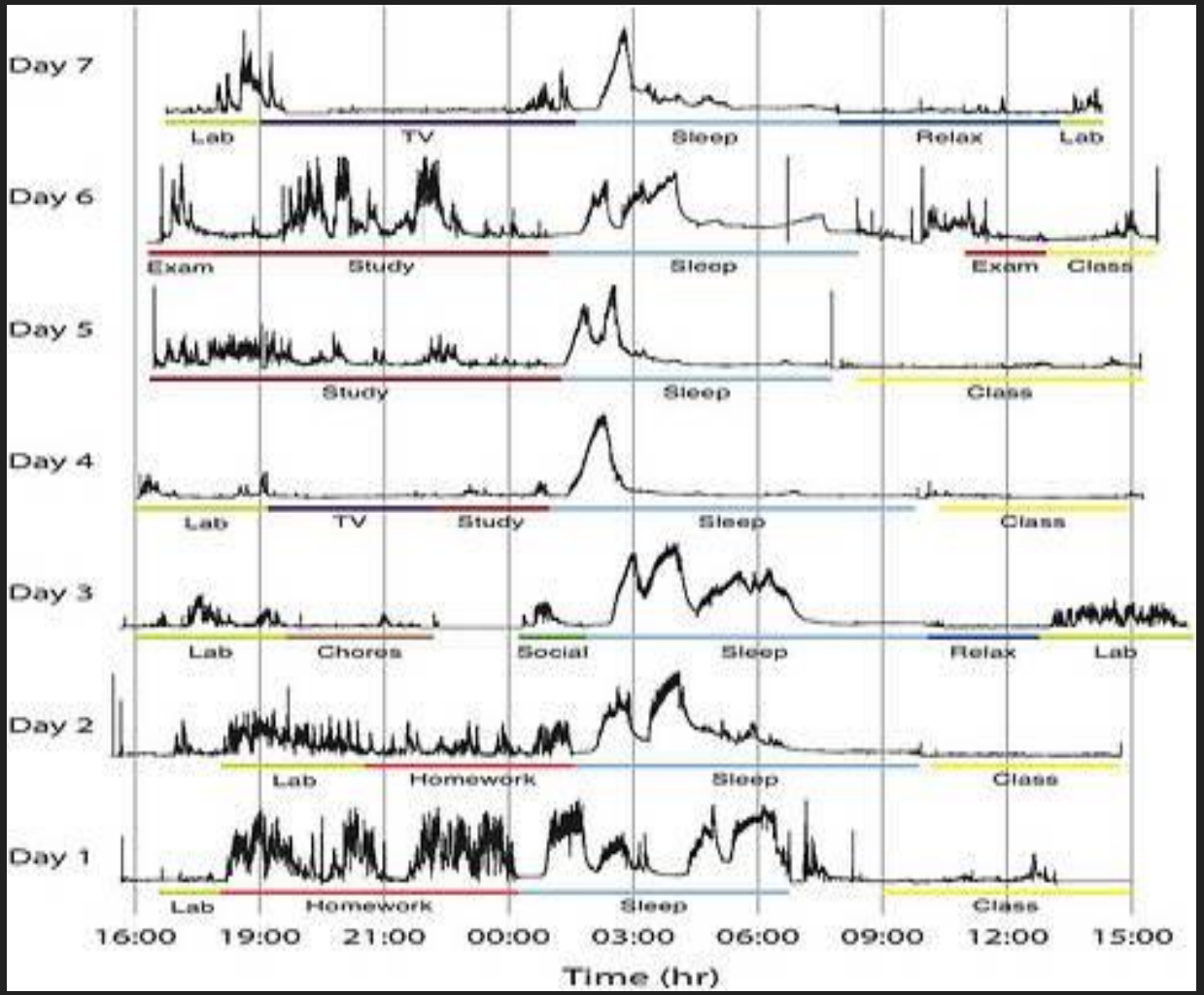
from “Improved Learning in a Large-Enrollment Physics Class” by Deslauriers et. al., Science, 2011.

A research study was conducted by a biomedical engineering group to study brain activity.

Which activity do you think required the **highest brain function**?

A. Attending lecture
B. Going to lab
C. Studying
D. Watching TV
E. Sleep

From Ming-Zher Poh, Nicholas C. Swenson, Rosalind W. Picard – “A Wearable Sensor for Unobtrusive, Long-Term Assessment of Electrodermal Activity.”



Highest brain activity:

sleep

Next highest:

studying
homework
lab

Very little brain activity:

class (lecture)
watching TV

What can we learn from this study?

Motivated by **Improved Pedagogy**: I wanted...

- my students to come to class prepared
- to even the playing field
  - variety of skill levels in introductory class
- to do more activities during class
  - student-centered learning instead of professor-centered presenting
- to provide an additional resource
  - pausable, reviewable, self-paced

Video lectures for the “Flipped Classroom”

- Supplements reading assignments
- Increases the number of **“contact times”** with the material:
    1. Video Lecture
    2. Classtime
    3. Homework
    4. Studying for exam
- Total **4 times** students engage with the material
- (And they sleep on it several times too!)

If we ask students to **participate** during class, we need to provide resources to **prepare** for class.

What qualities or elements make a video tutorial **useful?**

What are the **pros** and **cons** of **instructor-personalized** videos?

Evidence for benefits of instructor-personalized videos

- Lecture capture and picture-in-picture types outpace voice-over type
- Lighter cognitive load on students

Optimizing Working Memory

Cognitive Loads
(what the brain does while learning)

Intrinsic
Learning new knowledge/ course content

Extraneous
Understanding presentation design

Germane
Building new knowledge into existing framework

Instructor-personalized videos optimize working memory
(more space for learning new knowledge)

from Chih-Ming Chen, Chung-Hsin Wu – “Effects of different video lecture types on sustained attention, emotion, cognitive load, and learning performance.”

A topic is right for a video lecture if it...

1. Replaces portion of lecture when I would be writing on the board and talking
2. Is mostly definitional (I am just telling students our conventions)
3. Would be best viewed several times and/or paused
4. Is important to know before students can apply the concept

Style Considerations

- Short (4-6 minutes each)
- Broken into small “bite-sized” topics
  - Easier to record
  - Easier for students to review
- Continuous in style with class time (indicate continued importance)
  - If class time usually includes demos, examples, asked questions, the videos should too
  - Design class time slides to mimic the styles of the lightboard videos
    - Black/dark grey background
    - Bright, light-colored writing

Student Expectations

- Teach students **how to watch** videos:
  - take notes actively
  - record any questions they have
  - pause and rewatch as needed
  - make note of any videos they struggled with
- Give a simple online assignment, due the night before class, to motivate them to watch closely
- Collect and process immediate feedback (confusions, frustrations) right away

In the next class day

after students view videos

- **Address** and **squash** any misconceptions
- Prepare activities that **apply** video learning

Manage YOUR Expectations

Don’t expect overnight mastery!

Students will be familiar with new vocabulary, but not yet comfortable with the material.

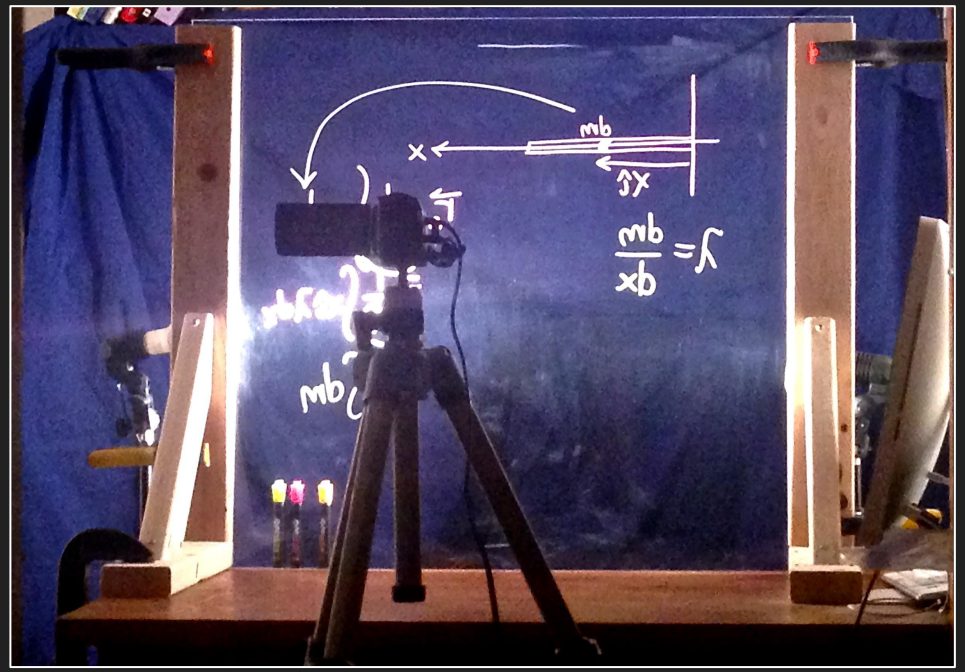
Student Feedback

13 videos (~one a week)
Introductory Physics Spring 2016
Enrollment: 45 students

- Significantly useful for review and note-taking (especially test review)
- Students appreciated being able to re-watch and pause material
- Viewed most often:
  - Videos of complex examples
  - Videos that reflected pre-lecture assignment questions

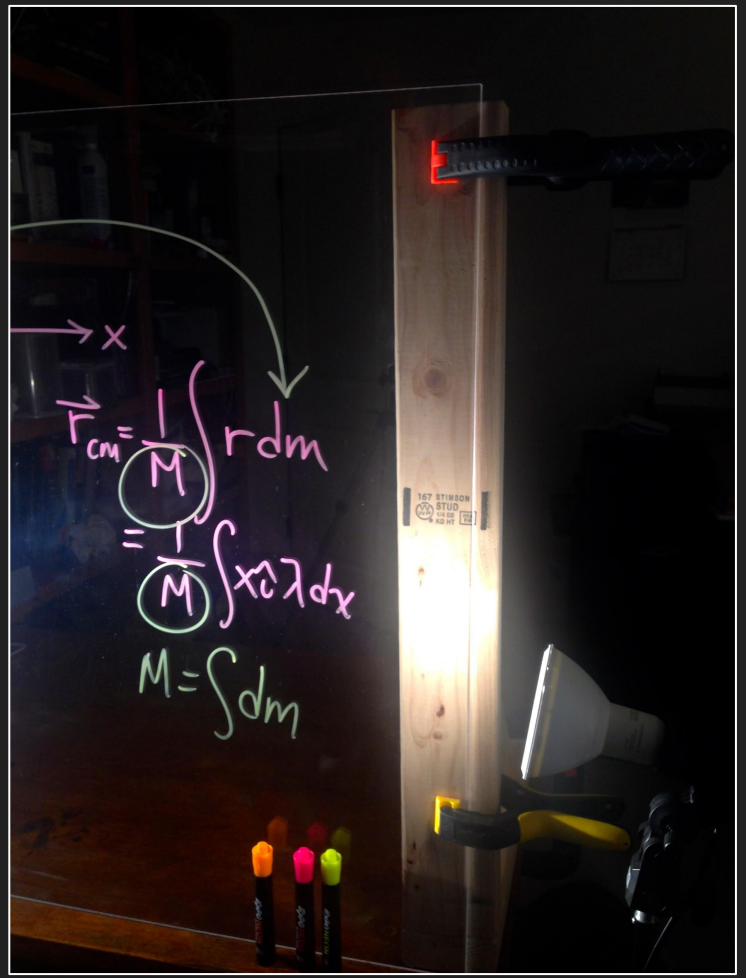
So…
how do I **build my own Lightboard**?

Sitting (Desk) Lightboard



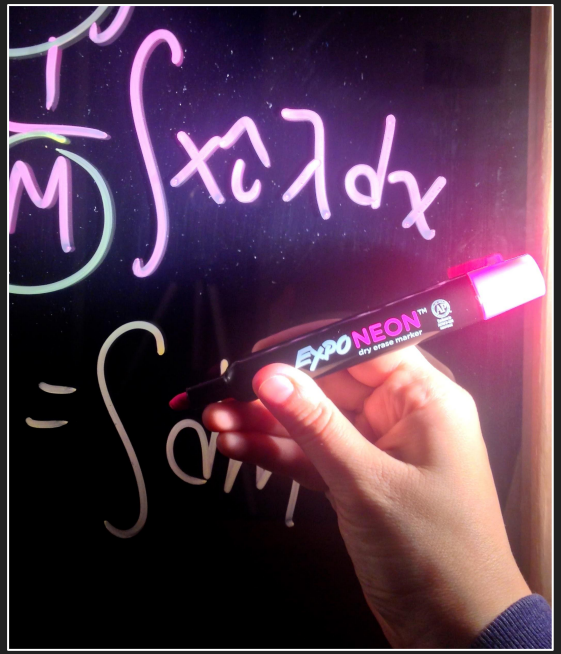
“Back stage”


x
$\vec{r}_{cm} = \frac{1}{M}\int r\,dm$
$M = \int dm$


x
$\vec{r}_{cm} = \frac{1}{M}\int r\,dm$
$= \frac{1}{M}\int x\,\lambda\,dx$
$M = \int dm$

Leg Construction

Two dim soft lights, directed perpendicular to board, light up neon dry erase markers and lecturer



Important Video Edit:
Flip right-to-left!

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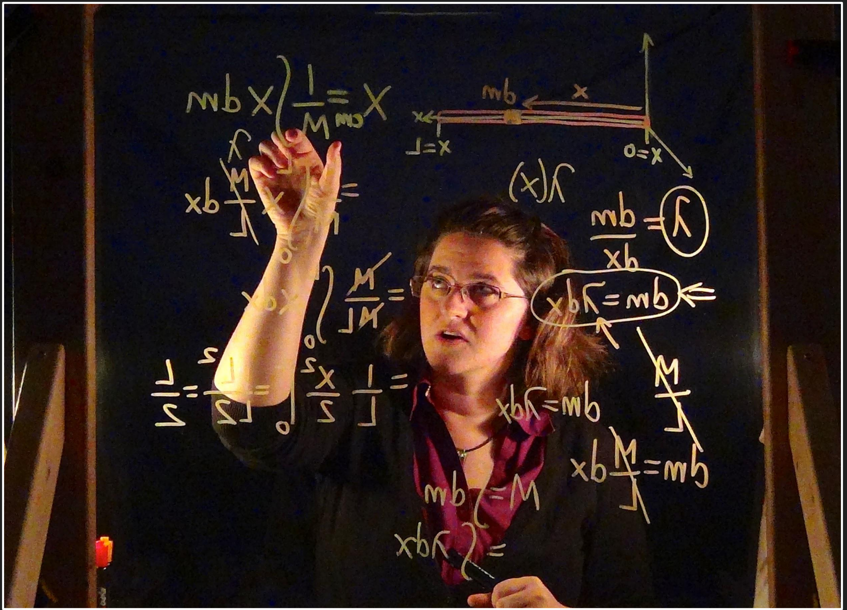
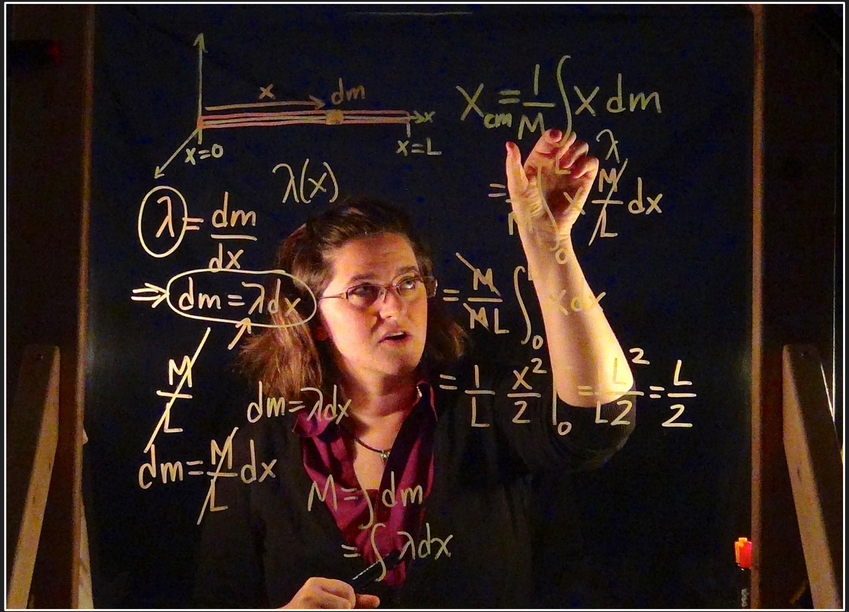


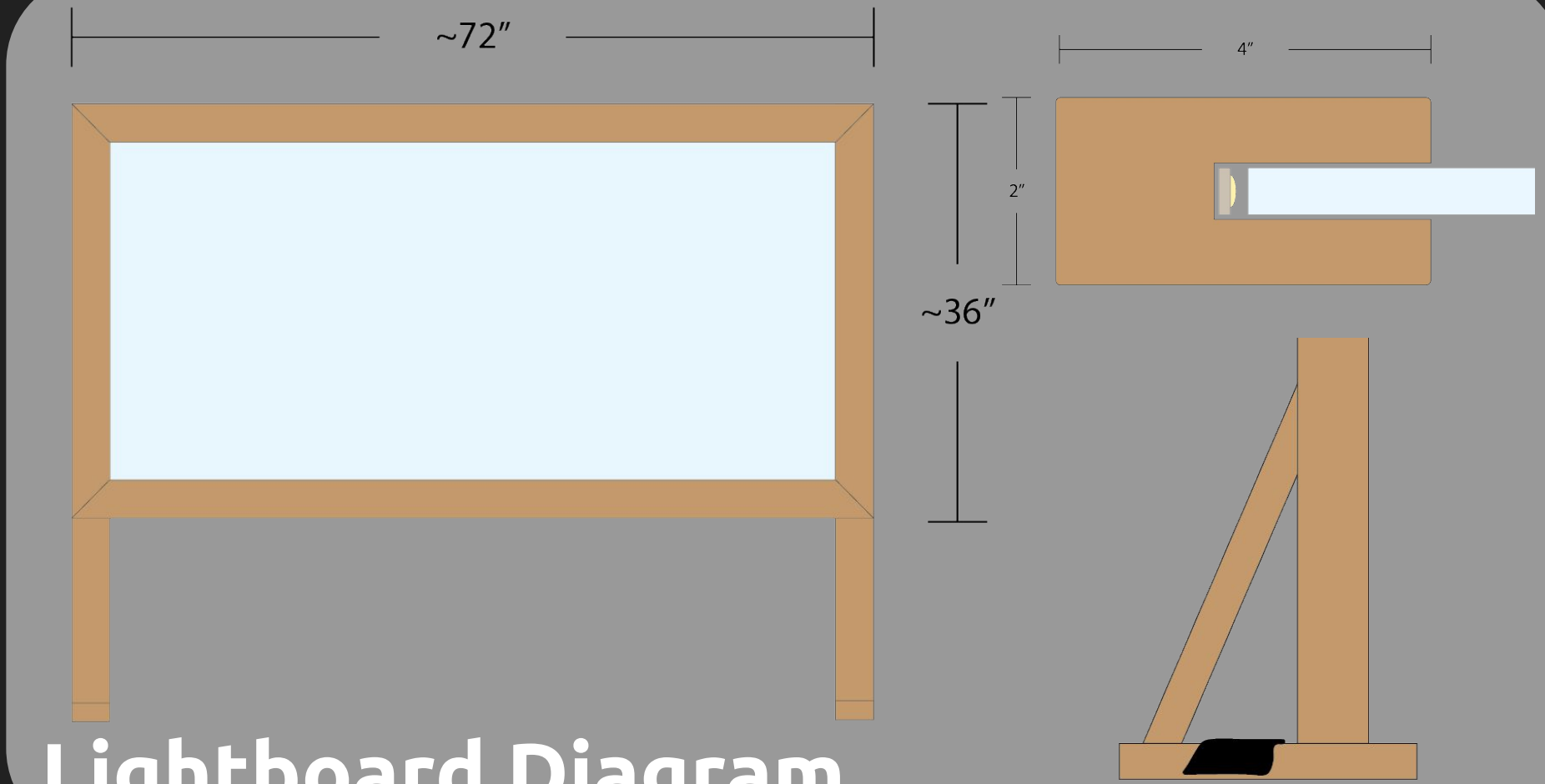


Standing Lightboard Purpose

- Less expensive than current builds
- Easy to construct, requiring few tools and little expertise
- Movable/mobile
- Available to anyone on campus
- Easy to support production (setting up lights, cameras, etc)

Building Concerns

- Safety
- Security
- Accessibility
- Ease of use



Lightboard Diagram

Expected Costs (approximated)

Plexiglass - Optix Acrylic Plastic Sheet	36” x 72” x .22”, 29 lbs	$130
Kiln-dried Lumber x3 (the frame)	2” x 4” x 16’	$17
Impact Saddle Sandbags x2 (to stabilize frame)	15 lbs, black	$44
LED tape light, cool white, high density x2 (to light up the plexiglass)	16.4ft roll, adhesive backing	$46
LED power supply, strip-to-strip connectors	60 watt	$20
Corner braces x2 (to hold together frame)	4”	$13
Mending plates x2	4”	$4
misc screws, wood glue, ebony wood stain		$15
	total:	**$289**

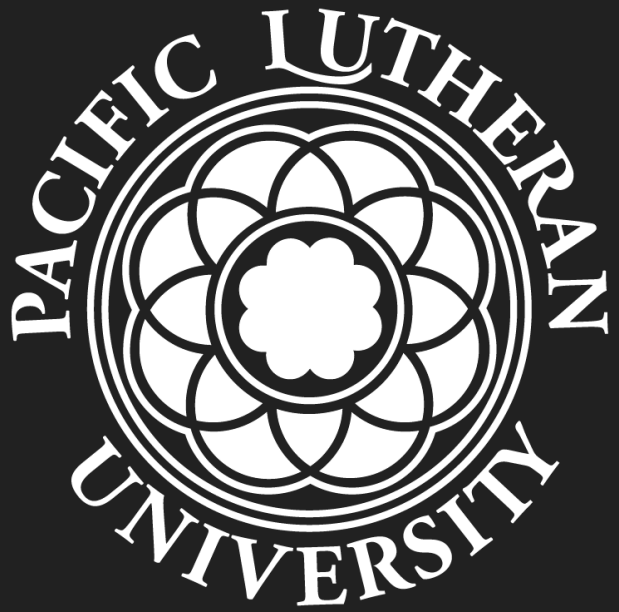
Potential Usage

What topics can you think of?
Tell us after the presentation!

- Drawing physics concepts, chemical structures
- Diagramming sentences in English classes
- Adding notations to foreign language grammar constructs
- Explaining musical notations
- HTML and CSS coding principles

Motivating Instructors

- How can you motivate instructors to make videos?
    - To put themselves in the videos?
    - To adopt active learning during class time?



Thank you!

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