Exploring and Applying Physics

Facebook group

Member's posts from 2022

Yuehai Yang
2. January 2022.

Happy new year with some natural decoration from Oregon! We had some beautiful icicle formations recently. The "rings" on them seem particularly interesting, since they're quite uniform (i.e., all ~1 cm wide). Following our recent fluid discussions, I searched a bit and didn't find conclusive studies on why it is this wide. The article in the comments has some testing experiments (the last 2 paragraphs) that disproved some hypothesis on this size effect, in my personal opinion. How do icicles in your area look like?

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Diane Crenshaw Jammula
8. January 2022.

Just wanted to shout out Eugenia Etkina for an absolutely fabulous workshop! Just the intellect, connection, and energy I needed going into this new year with Omicron. What an impressive and international crowd! I miss our old-school in person meetings, but Eugenia rocked the virtual setting and I'm honored to learn with/from people around the world. Thankful for you all! Let's rock this year!

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Carolyn Sealfon
14. January 2022.

I'm drafting an application experiment for a lab for Ch. 23. Students have a magnifying glass as part of their kit (we are online and they are doing experiments at home). I'm planning to ask them to design experiments to measure the focal length of the magnifying glass two different ways. Any suggestions or potential pitfalls that I should be aware of, that I might not be?
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Carolyn Sealfon
15. January 2022.

Listening to the audiobook of bell hook's "Teaching to Transgress", in Ch. 10 the discussion about student voice made me think of ISLE. This is just one quote that doesn't do the discussion justice, but as a taste: "In regards to pedagogical practices we must intervene to alter the existing pedagogical structure and to teach students how to listen, how to hear one another." -bh

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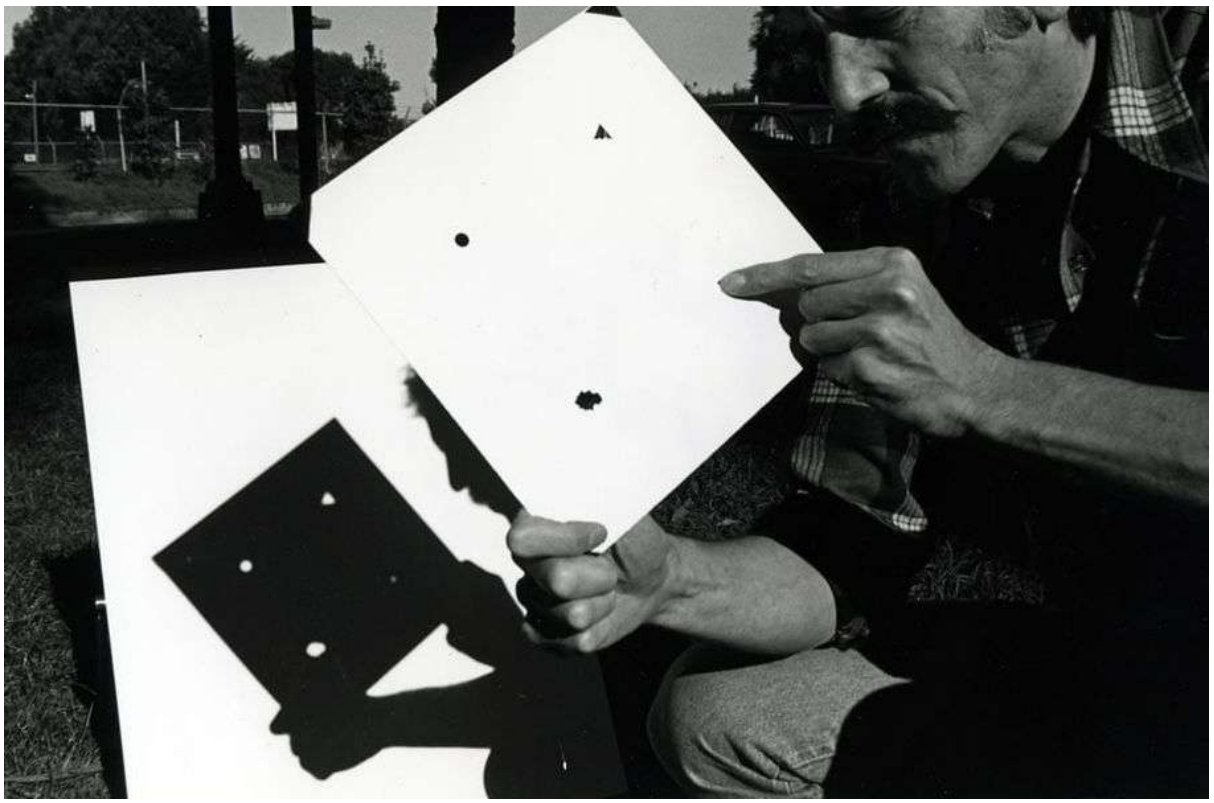
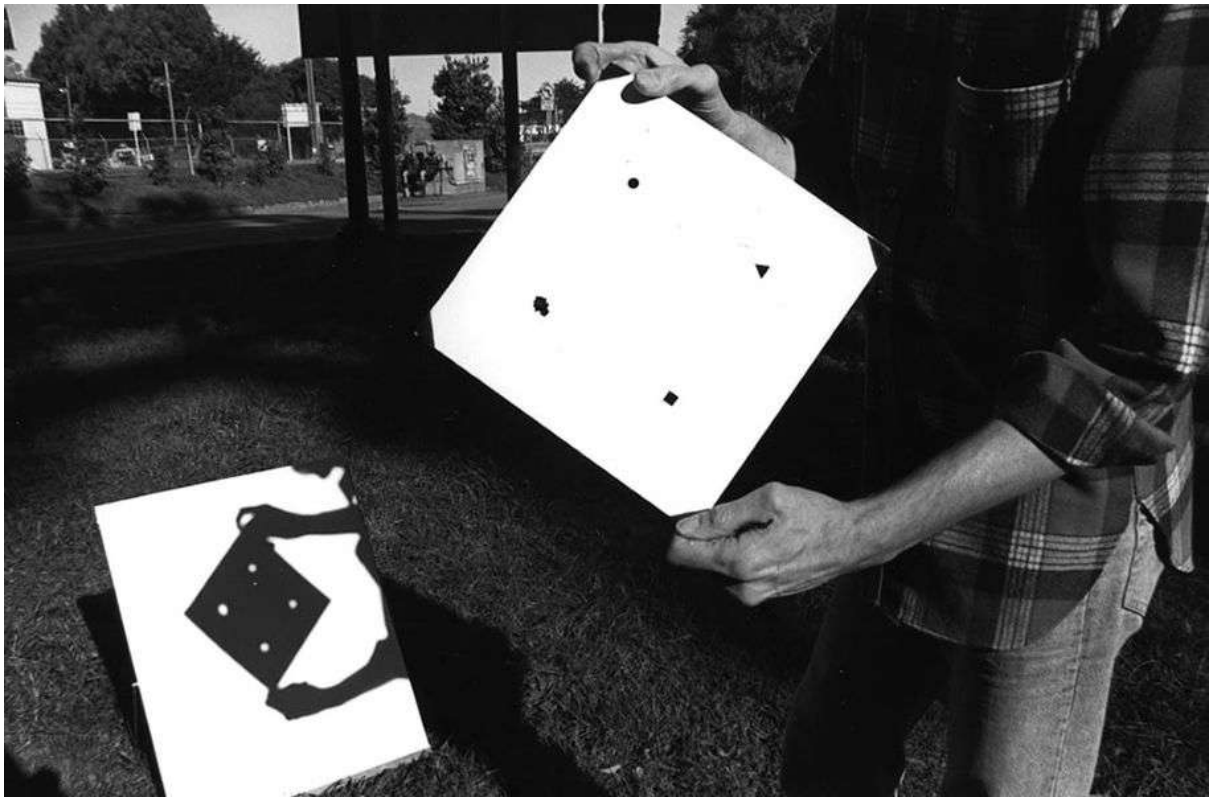
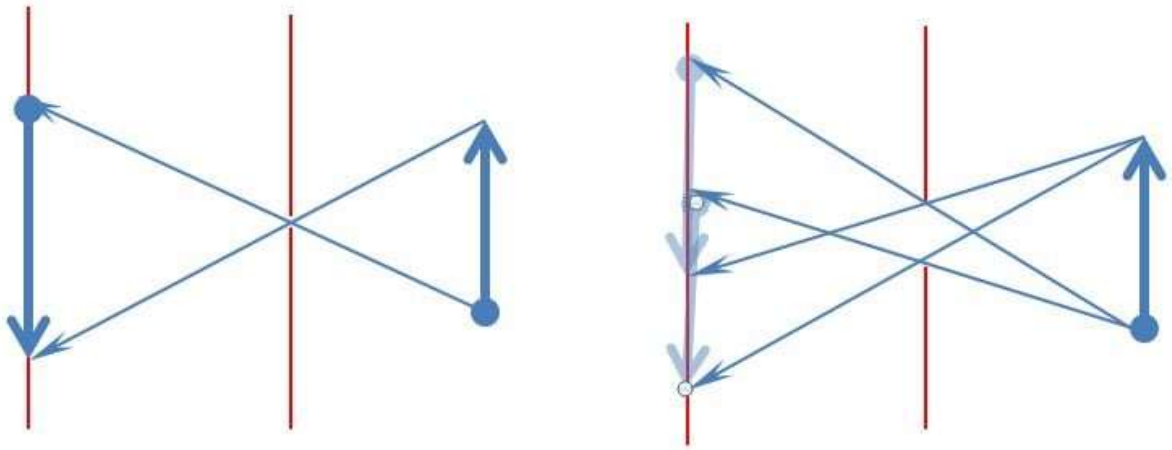
U9pUlpW35OD6S3nzhrQ8hKnz1YIaaNDVle4Wq4GY0qcwjEw0QcFaD-Q&__tn__=%2CO%2CP-R

Ashutosh Bhakuni
16. January 2022.

I came across Exploratorium's wonderful page Light Walk activities (by Bob Miller) on exploring pinholes in the sun. I tried the activities.
I understand the explanations of inverted image of pinhole and blurry image with a bigger circular hole for the same screen distance/ focal length. My question is related to observations in first 2 images- why doesn't an irregular or polygon shaped hole work like a pinhole camera when held at or close to the screen? It requires some distance between the hole and the screen to make an image. I want to understand the path of light rays for the two situations and the transition from hole shape to image of source. When I take the holes away from screen, say for triangle, it seems that circles start to grow at the vertices so that from a sharp triangle shape I get a rounded triangle and then a circle (Sun image), but it has an inverted bright triangle in the center..
Most explanations only discuss a conventional pinhole camera with a small circular hole and a fixed hole-screen distance, and mention how a bigger hole causes a blurry image of the object (3rd image). They dont discuss that for the above case of a big non-circular hole at first the lighted area is same shape as the hole (not object) and quite sharp.
The explanations for the simple pinhole with rays going through the hole to make an image are shown for small holes; but any size hole works as camera lens at sufficient distance. Also, for a distant object or Sun, the rays are parallel…so I am unable to relate to the ray diagram explanations of slanted rays from top and bottom of the object entering the pinhole to make an inverted image.
Thank you.







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Chrisso Mallouris Konomou
18. January 2022.

Question about PUM lesson Physics II Kinematics "Free Falling" lesson. I was looking at the solutions (9.1) and it says the hypothesis is that the ball is going at a constant pace. Students need to predict how long it will take to fall using the mathematical statement. In the solutions it also says that the assumption is that the ball is going at a constant pace. So hypothesis and assumption are written as the same. Is the more appropriate setup that students are testing the mathematical statement itself, and assuming the ball is going at a constant pace? It makes more sense to me, but I just want to make sure.

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Hrvoje Miloloža
21. January 2022.

Question for high school teachers who use ISLE as their only/main teaching approach and at the same time live in non-english speaking country in which there is no inquery-based high school textbooks:
Which materials do you assign your students to read after the class?

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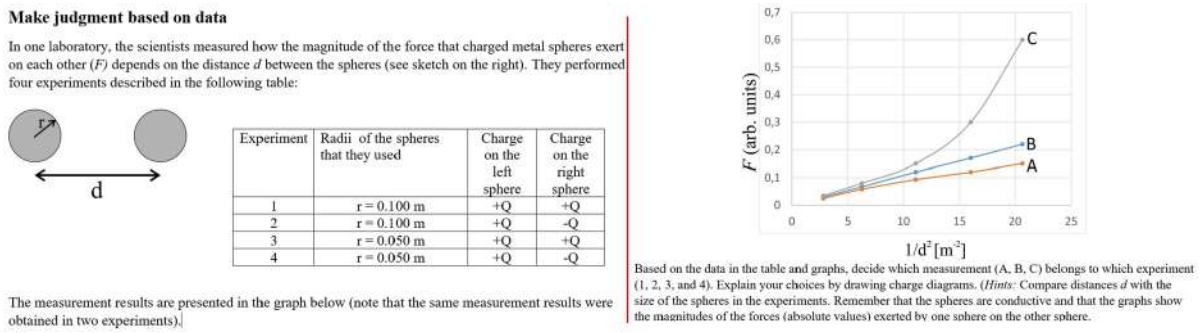
Gorazd Planinsic
22. January 2022.

While we are discussing electric charge and electric force, I would like to share with you a problem that I recently designed. The problem falls into the category of problems in our textbook called “Make judgment based on data”. It would be great to see how you solve this problem and what you think about it in general.



Make judgment based on data

In one laboratory, the scientists measured how the magnitude of the force that charged metal spheres exert on each other (F) depends on the distance d between the spheres (see sketch on the right). They performed four experiments described in the following table:

Experiment	Radii of the spheres that they used	Charge on the left sphere	Charge on the right sphere
1	r = 0.100 m	+Q	+Q
2	r = 0.100 m	+Q	-Q
3	r = 0.050 m	+Q	+Q
4	r = 0.050 m	+Q	-Q

The measurement results are presented in the graph below (note that the same measurement results were obtained in two experiments).

Based on the data in the table and graphs, decide which measurement (A, B, C) belongs to which experiment (1, 2, 3, and 4). Explain your choices by drawing charge diagrams. (*Hints:* Compare distances d with the size of the spheres in the experiments. Remember that the spheres are conductive and that the graphs show the magnitudes of the forces (absolute values) exerted by one sphere on the other sphere.

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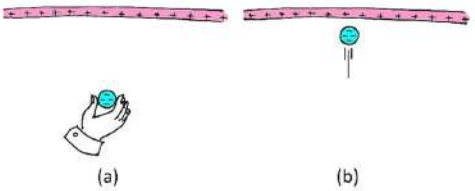
Gorazd Planinsic
2. February 2022.

Hi all. Today I am posting a new problem that fits to the current theme posted by Eugenia Etkina : electric potential energy.

Students were solving the following problem

You are holding a negatively charged plastic ball below a large positively charged plate (see figure below). When you release the ball, it speeds up toward the plate. Let the initial state be when you are holding the ball (figure a) and the final state, before the ball hits the pate (figure b). Describe in words the energy changes between the initial and the final state.



(a) (b)

For each of the student descriptions on the next page select the system for which the student response is correct.

Student description	*System*				
	Ball Plate Earth	Ball Plate	Ball Earth	Ball	None of pervious
The electric potential energy is decreasing. As a result, the kinetic and the gravitational potential energy are increasing.					
The electric potential energy is decreasing and the kinetic energy is increasing. However, since some negative work is done on the ball, the kinetic energy increases less.					
As positive work is done on the ball its kinetic and gravitational potential energy increase.					
Earth does negative work on the ball and the electric force does positive on the ball. As a result, ball's kinetic and gravitational potential energy increase.					
Earth does negative work and electric force does positive work on the ball, but since the latter is larger in magnitude, ball's kinetic energy increases.					
As positive work is done on the ball its kinetic and gravitational potential energy increase and the electric potential energy decreases.					

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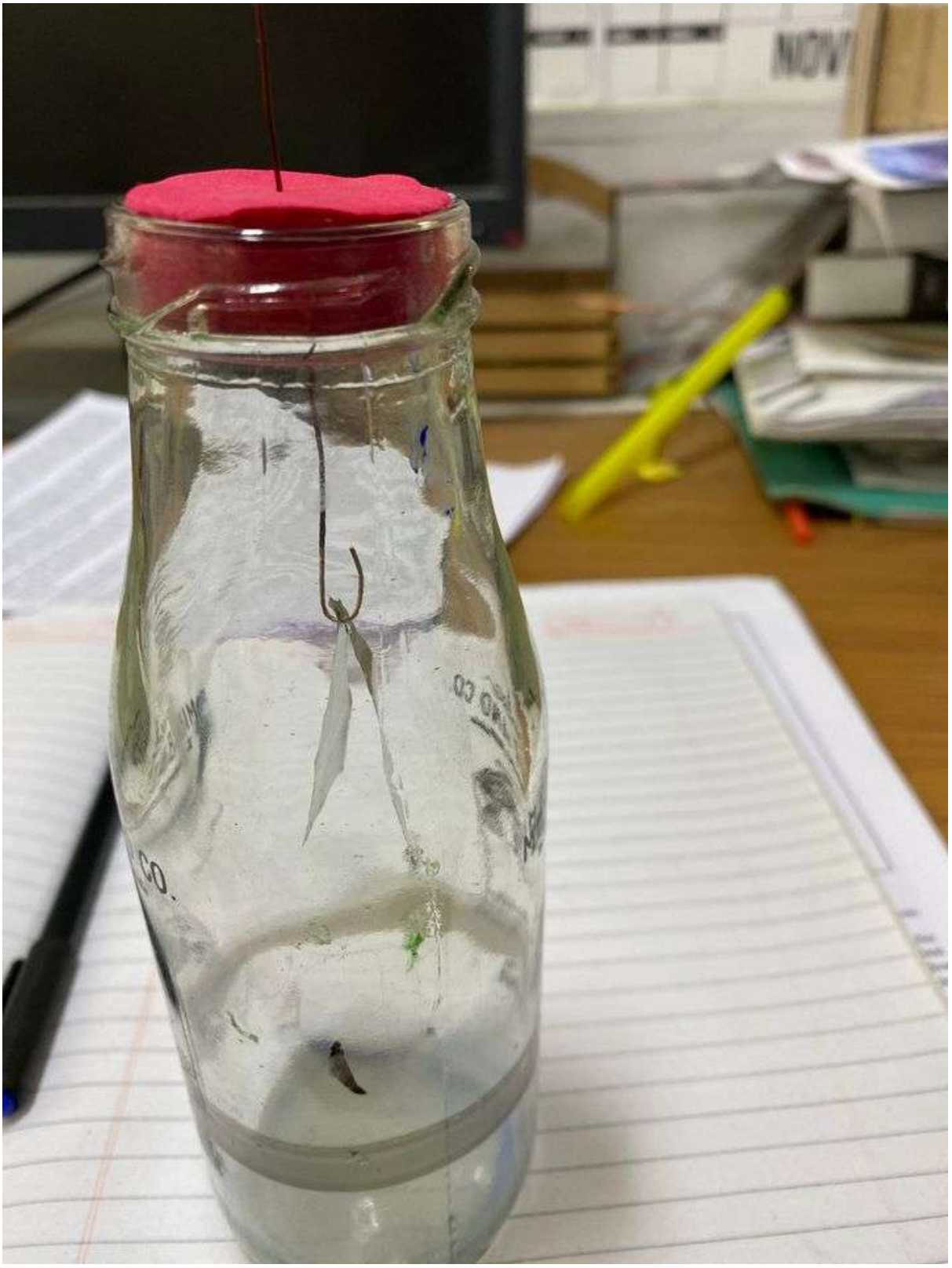
Ashutosh Bhakuni
4. February 2022.

I made an electroscope with 25 swg “insulated” copper wire. Insulation was removed from the hook part where aluminium foil leaves hang. I am able to charge the leaves by induction- bringing charged straw near spiral makes leaves repel, touching spiral with fingers while holding straw near spiral makes leaves collapse, removing finger and then straw makes leave stay repelled, bringing same charged straw near spiral makes leaves come close, touching spiral with finger makes leave come close (discharge) and stay there. But touching spiral with finger makes discharges the charged leaves in the other case.
Question: Should the fact that spiral is covered with insulation have made a difference on touching it with finger compared to if it was bare copper wire? Why does it work even with insulation? If i touch the spiral with the charged straw with leaves initially discharged, the leaves repel; but they collapse on removing the straw, implying that charging by conduction is not working.
I intend to next try this by not removing insulation even from the hook where foil leaves hang. My reason for removing it was to make electrical contact between foil and wire.
I also saw a video where a person had used paper leaves with bare copper wire and it was working. How do we explain that? I intend to try that too.



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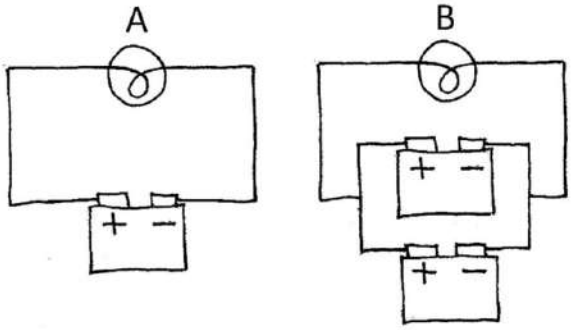
Gorazd Planinsic
13. February 2022.

Mark Lenfestey asked if we have a similar type of problem that I recently posted (choose the option with the correct answer and best explanation) that involves real batteries. Here is one:

You have two equal lightbulbs and two equal real batteries (batteries with non-negligible internal resistance). Using these elements, you build circuits A and B (see figure below). You may assume that the resistance of the connecting wires is negligible.



Choose the option that correctly compares the brightness of the bulbs in circuits A and B and gives the best explanation.

(a) The lightbulbs are eqaully bright, because they are equal.
(b) The lightbulbs are equally bright, because the voltages across the lightbulbs are equal.
(c) The lightbulb in circuit B is brighter than the lightbulb in circuit A, becaue the effective internal resistance of two parallel bateries is smaller than that of a single battery.
(d) The lightbulb in circuit B is brighter than the lightbulb in circuit A, becaue the voltage accorss the lightbulb in B in larger than the volatge across the lightbulb in A.

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Hrvoje Mitrović
14. February 2022.

A few days ago one of my students asked me: "Is it ok if I use Solve equation option on calculator to solve for an unknown given all the data?"
My first thought was: "No, no, no, you are just going to dumb yourself down. You won't be able to check for limiting cases or find what the proper units are. Besides, solving for an unknown is fun if you are good at it".
I wrote him instead: "Hmmm, I'm not sure if the reviewers would give you full credits for that. I would personaly stick with solving for an unknown by hand".
To give you the context, I prepare groups of students for physics state exam for college admission. More often than not the problems are quite straighforward and solving for the

unknown is the most common source of error. They practice a lot but errors still occur. I completely understand my student's logic: "If I often make math mistakes and my calculator can help me with that then why in the world I woudn't use it to my advantage?"
Remember, state exam is really really important to them and they are constantly looking for shortcuts.
Has anyone come across similar question?
Do you look differently on that issue in normal school/college scenario and in taking high stakes tests?
Is there something more that students loose by using Solve equation option besides not being able to check limiting cases, draw a function or check units?

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Zilla Rox
16. February

Anyone have a hot air balloon lab that they know works well with a blow dryer? I want to try one out but I don't know 🤷‍♀️ I've seen it done but that teacher passed away a few years back. She was awesome.

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Susheel Singhal
20. February

I need help with some suggestions and recommendation for online assessments during online teaching. Our school is using Microsoft Teams platform to conduct virtual classes. All your help will be highly appreciated.
Thank you so much. 🤗 🙏 🌹

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Kristina Pahor
28. February

Hello to everyone!
I am looking for ideas about how to make students do revision. Namely, we finished the syllabus and we should revise for their IGCSE exams. So we have roughly 2 months to revise 2 years of physics lesson.
Does anyone have suggestions how to do it in such way, that the students will be at the centre of the learning process? I use ISLE for acquiring new knowledge, but until now I never had a muliple months revision time.
I thought about solving exercises and past papers as group work, but I wondered if someone can share any more involving practice or even helpful resources.
Thanks in advance for your help😊

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Bridget Schober
2. March

I have a strong student that can calculate circuits all day long but wants a better explanation than I can come up with for the following question. "A 6 ohm bulb connected to a 6V battery has 1A of current flowing through it. When the 6 ohm bulb is connected in series with another 6 ohm bulb, .5A of current flow through it. How do the charges "know" that there is more resistance later in the circuit so that less C/s pass a point?" I know that the deltaV is now 3V for each bulb but what happens on an electron level that makes that happen?

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Melissa Vigil
2. March

One of my life-sciences students said today after lab, "I really like physics. It is reigniting my curiosity about things."

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Gorazd Planinsic
14. March

Following Eugenia Etkina 's post on models of light I am posting a video of the testing experiment of the bullet model of light for refraction https://youtu.be/dk51phOkoWs

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Yuehai Yang
25. March

Came across this one today... Knowing that many of us do groupwork in our classes, I wonder how you prevent students from "splitting the task", especially when there is motivation to do so, such as getting the work done quickly, and whether or why you think it is important (or not).

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Diane Crenshaw Jammula
31. March

Hi Thermo Instructors: we are looking to reform our 300-level Thermodynamics course for physics majors. The textbook is terrible. Is there a textbook you'd recommend? This is our starting point. We already teach all of our Intro Physics classes at Rutgers, Newark using ISLE. Any other ideas and resources appreciated! Thank you for your help!

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Carolyn Sealfon
31. March

CourseSource has expanded to physics! It's basically a way to turn original, innovative teaching materials into peer-reviewed publications:

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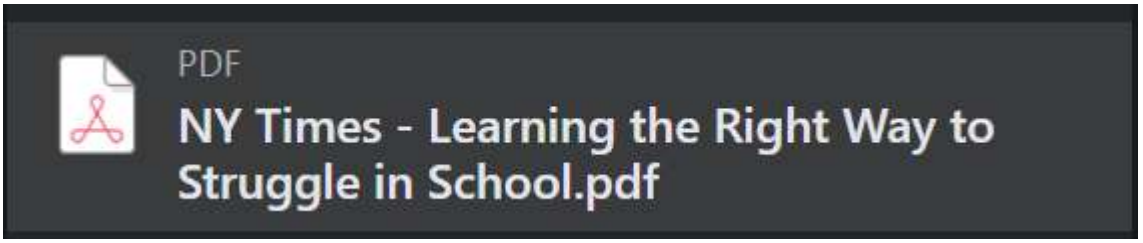
Andrew Yolleck
5. April



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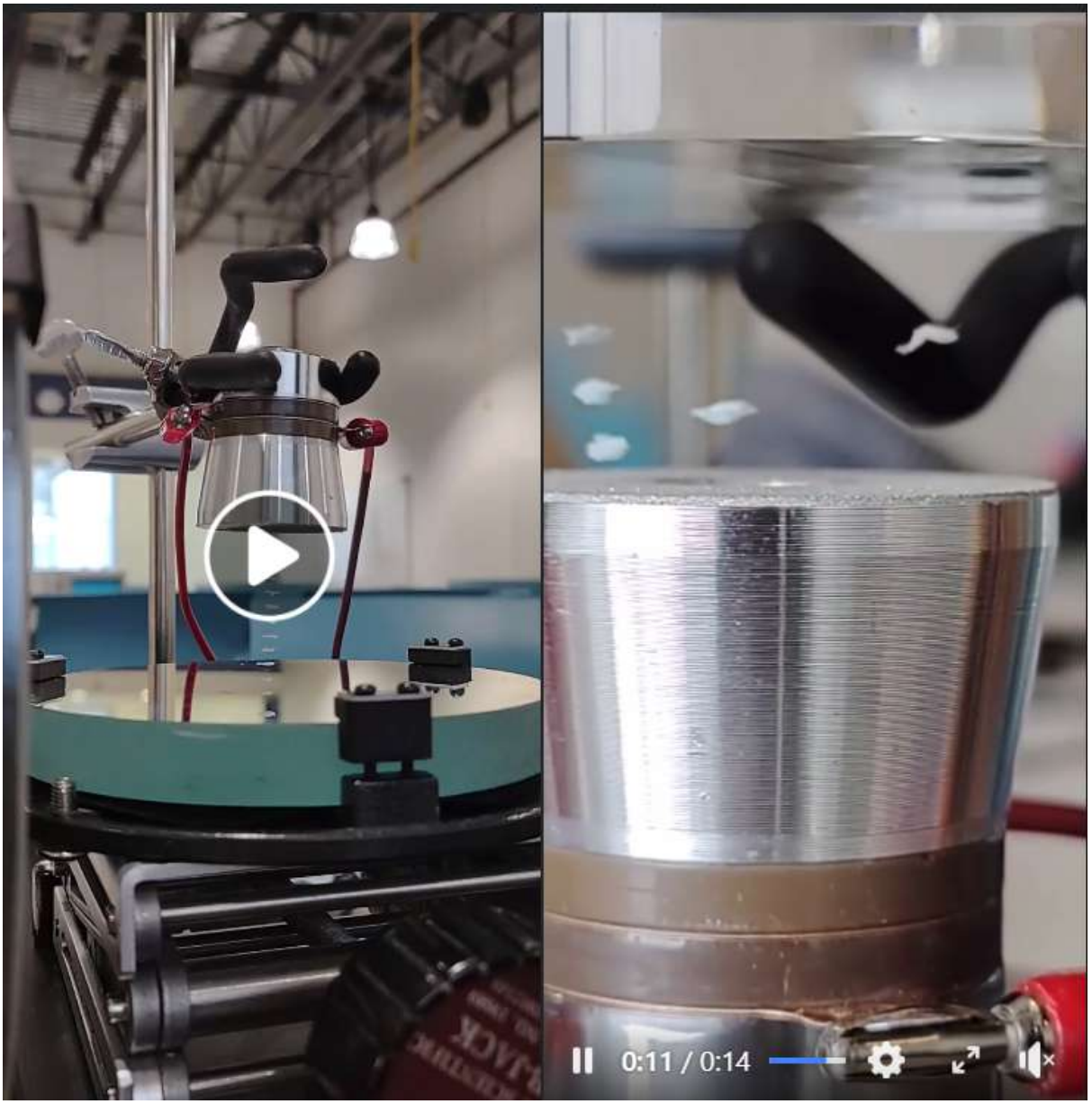
Yuehai Yang
6. May

Hope to share a small student project (or in-class observation/testing) for folks here: "acoustic levitation" (i.e. with styrofoam), or "vertical kundt's tube"(except there's no tube), or "acoustic tweezer" (you can set it up in all directions).
Only tools needed are an ultrasound speaker (<$20 on Amazon), a signal generator, and an amplifier for music.
Very low cost but plenty of opportunities to explore models like standing wave, as well as concepts like reflection, resonance, wavelength, wave speed, frequency, nodes...

Warning: high pitch sound in the video.



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Paul Bunson
7. May

Hi all! I was discussing with Eugenia the other day that I have a workshop to go with the materials in the Relativity chapter. It's in two parts, the first involves classroom activities to build conceptual understanding, particularly for Breakdown of Simultaneity, and the second

part focuses on a manageable approach to spacetime diagrams. I've been doing these for quite some time and students find it highly engaging.
I am hoping to run the workshop on June 18 from noon to 3pm (west coast US time). Use the form below to sign up to make sure we have enough people. Let me know if you have questions.
https://docs.google.com/.../1FAIpQLSebmtjBorg.../viewform...
[Ok... sorry about any confusion on the link! I think I've learned a few things about Forms. Once again, it should be fixed.]

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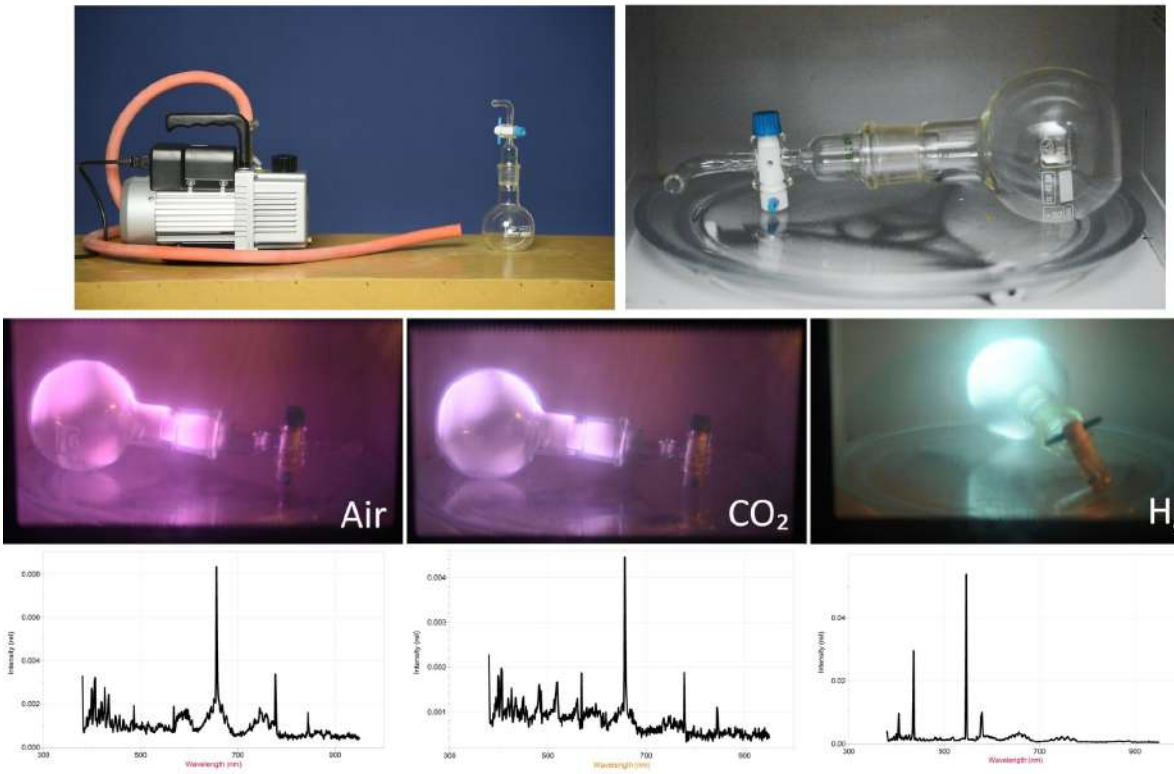
Gorazd Planinsic
7. May

Let me share some experimental ideas about the last topic posted by Eugenia. Commercial discharge tubes filled with different gasses are great, but they do not allow students to experience the important steps that are needed to make the gasses glow. Relatively simple experiment that allows this was recently described as a part of a longer paper in American Journal of Physics (Barnes B K et al, Am.J.Phys 89, 372 (2021); doi: 10.1119/10.0002706). Here I only describe my experience with the experiment. You can find more details in the cited paper. The idea is simple. If you put a flask filled with air at ambient pressure in a regular microwave oven and turn the oven on, nothing will happen. However, if you pump some air out of the flask (I used 250 ml flask and a regular pump with which I reached the pressure of about 0.2 kPa in the flask) and put it into microwave oven, then air in the flask will start to glow in beautiful magenta-like color few second after you turn the oven on. The plasma that forms in the flask will quickly heat the flask to a very high temperature. Make sure you do not keep plasma glowing for more than about 5 seconds and use protective gloves when taking the flask from the oven. In addition to air, I also performed experiment with carbon dioxide (first I filled the flask with CO2 from a cartridge and then pump it out) and mercury vapor (I put a small droplet of Hg in the flask, shook it, poured the Hg out of the flask and then pump the air out). I also took spectra of the glowing flasks using Vernier spectrometer. See the photos in the attached image.
Through this experiment students learn that the pressure of the gas needs to be sufficiently low to start glowing, that one way to start such process is to expose the gas to rapidly oscillating electric and magnetic fields and that the light emitted by the glowing gasses produce line spectra.



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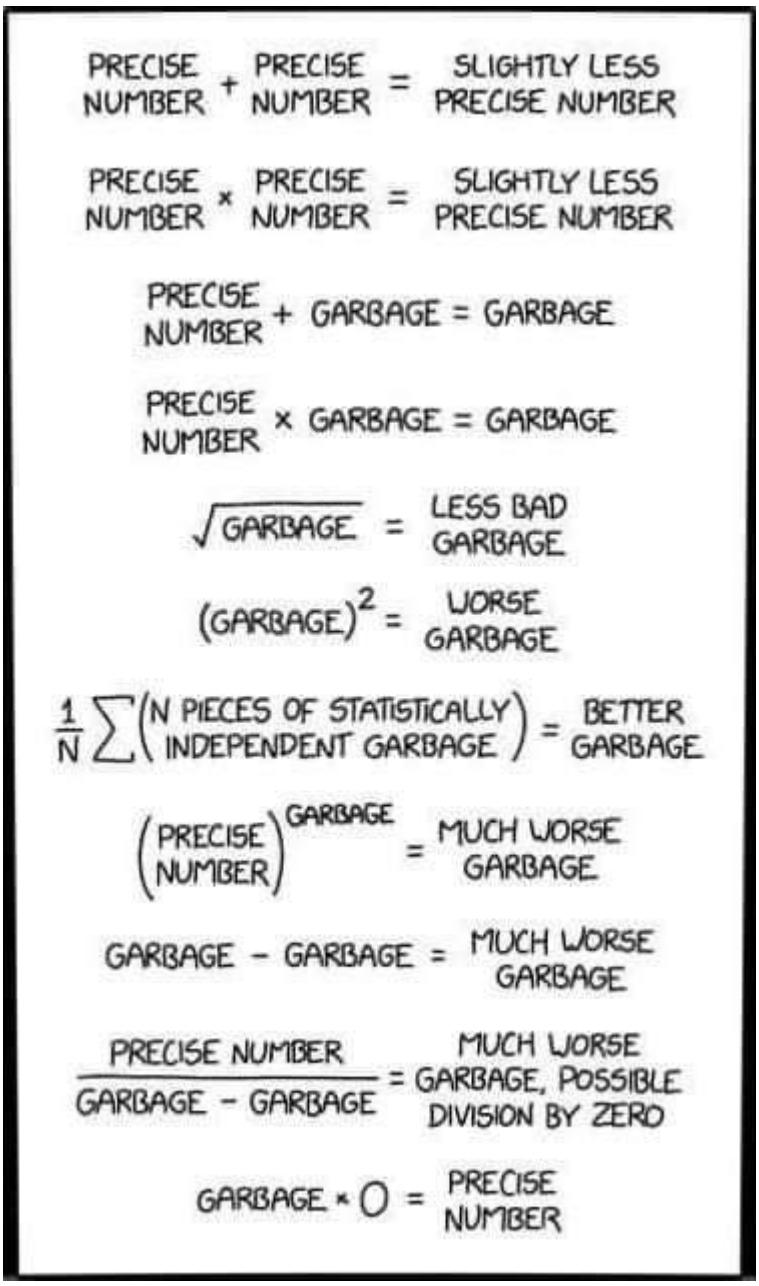
Matt Blackman
8. June

Following up on our meeting about experimental uncertainty:



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Paul Bunson
15. June

Hi everyone- Just a reminder that I am running a workshop on teaching Special Relativity this Saturday. (Noon-3pm West Coast US time) The first half will focus on class activities that address the conceptual side, featuring a sequence that builds up to the Breakdown of

Simultaneity. (Not the "train paradox" which is too complicated to start with in my mind.) The rest of the time will be spent on a slightly simpler approach to Spacetime diagrams that is appropriate for a variety of levels. Time permitting, I will also share many follow up questions appropriate for formative and cumulative assessment. All of this complements Eugenia's book quite nicely.
A few more people signing up would be great. Link is below. Let me know if you have questions.
https://docs.google.com/.../1FAIpQLSebmtjBorg.../viewform…

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Kendall Helt
28. June

Is the OALG used instead of the ALG or do I need to read through both of them?
Is this the correct place to ask questions as I work through the text and plan lessons or is there another group that is better for that?
Where would I find the answers to the Review Questions? If they are in the IG or the ISM I am overlooking them. The student text says to ask the instructor for the answers.
Thank you !!!

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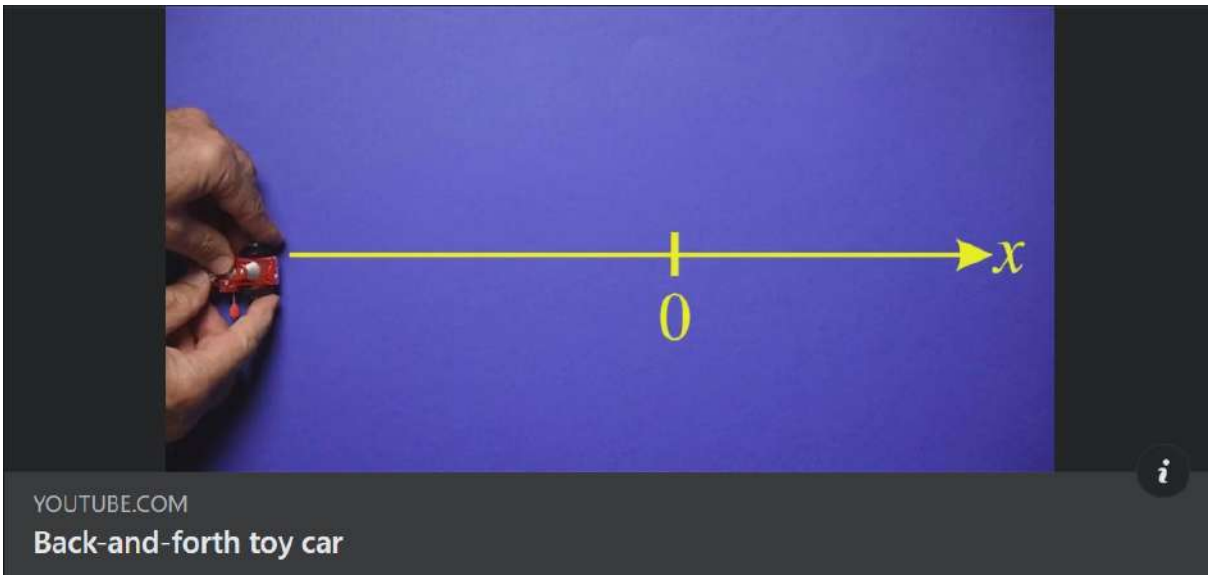
Gorazd Planinsic
1. July

In chapter 2 (Kinematics) we have definitions of several quantities describing motion that are difficult to remember. The following problem (new, just devised using the toy car we bought in an amazing store in Lund, Sweden) helps the students practice the differences in these quantities as well as kinematics graphs. In case you do not have the textbook, the definitions are pasted below. Please submit your solutions!
Here is the problem: Observe the motion of a toy car in the video https://youtu.be/1AT5TJ6pyks (the car changes the direction of motion by flipping) and sketch the following qualitative graphs of the car motion from the moment the person releases the car:
· Position-versus-time graph, x(t)
· Scalar component of displacement-versus-time graph, d_x(t)

· Distance-versus-time graph, d(t)
· Path length-versus-time graph, l(t)
Use the following definitions of the terms (see College Physics Explore &Apply, page 21)
-The position of an object is its location with respect to a particular coordinate system.
-The displacement of an object is a vector that starts from an object's initial position and ends at its final position.
-The magnitude (length) of the displacement vector is called the distance.
-The path length is how far the object moved as it traveled from its initial position to its final position. Imagine laying a string along the path the object took. The length of the string is the path length.



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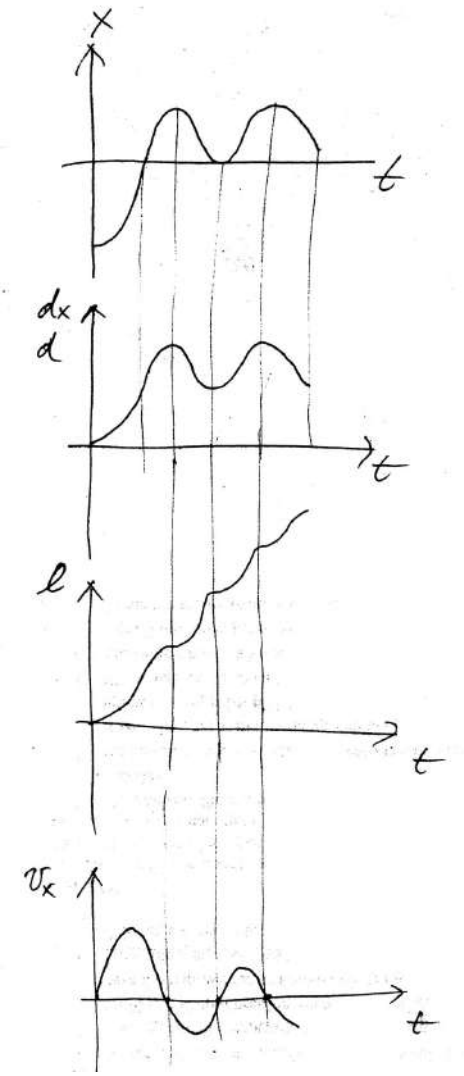
Gorazd Planinsic
3. July

Thank you Hrvoje Milološa and Kendall Helt for sharing your solutions to the problem that I repeat bellow and for the lively debate that followed.
The problem:
Observe the motion of a toy car in the video https://youtu.be/1AT5TJ6pyks (the car changes the direction of motion by flipping) and sketch the following qualitative graphs of the car motion from the moment the person releases the car:
· Position-versus-time graph, x(t)
· Scalar component of displacement-versus-time graph, d_x(t)
· Distance-versus-time graph, d(t)
· Path length-versus-time graph, l(t)

I am posting below my solution. As expected, we all agree about x(t) and l(t) graphs but have different views about d_x(t) and d(t) graphs. I totally understand your arguments Hrvoje and I am sure many colleagues were thinking in the same way. My solution is basically the same as that posted by Kendall. Let me explain how I reason when I was drawing the d_x(t) graph.

The problem requires from student to draw displacement-VERSUS-TIME graph. This means that the graph should show what the displacement of the object (with respect to the initial position) is for every time t. One way to check if the d_x(t) graph is correct is to check if it is consistent with the v_x(t) graph. We know that the surface area under the v_x(t) graph (say from t=0 to t=t') should be equal to the displacement of the object in time interval from t=0 to t=t'. If you look at my graph d_x(t) and the v_x(t) graph at the bottom of the picture, you will see that they fulfil this condition. The consistency between the d_x(t) and v_x(t) graphs is important when solving problems (see Question Q2.15 on page 44 in our textbook).



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Kendall Helt
4. srpnja u 05:10 ·
I can't imagine writing a text and answer key, even in math which is my stronger area! I think I read that you all are working on a new edition and wanted to mention that Chapter 2 Problem #26 asks "How far..." but the instructor solutions manual answers "How long" Just FYI in case it helps!

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Kendall Helt
4. July

I sure want to tell students to always represent positive to the right. I can see (Chapter 2 Question 7 for example) that the text does not do that. And I do like that in that problem they have to be very careful to see that positive is to the right. But I feel as though students will make fewer mistakes if they are consistent. What has been your experience with what students choose to do with horizontal motion (left is negative right is positive or visa versa)? What do you all encourage your students to do?

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Chrisso Mallouris Konomou
5. July

Hello Everyone. I'm working through A.L.G Ch 5, question 5.5.7. The first part of the question ask to find the velocity of the space shuttle 200 km above the Earth's surface. I calculated r to be 6578x10^3m (200 km plus the radius of the Earth). In the solutions it lists r 1.496x10^9m. I don't understand why. I must be missing something really silly, but I was very eager to post anyway to see if someone can help me out.

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Rebecca Kung
8. July

PUM kinematics frequently uses "battery-operated toy cars" that are fast and slow with constant velocity. Does anyone have a good source for these?
Also, has anyone compiled a list of recommended equipment for all the PUM modules? (I know that I can change/adapt as needed, but such a list would help get me started.)

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Hrvoje Miloloža
11. July

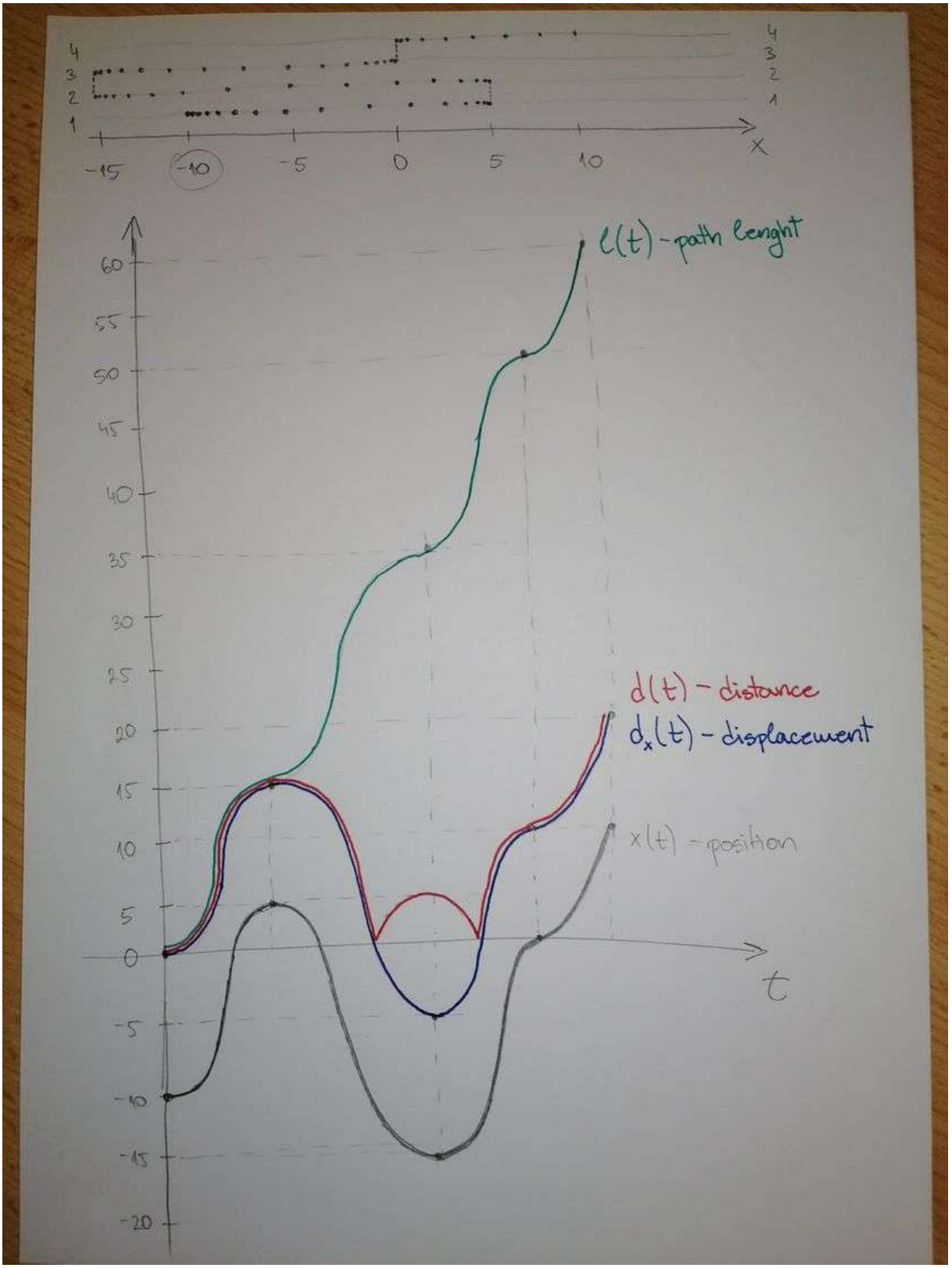
Here's a few ideas to wrap up our discussion on drawing x(t), d_x(t), d(t) and l(t) graphs (position, dispacement, distance and path lenght versus time graphs, respectively) 🙂

Possible situation (see attached picture):
Soccer player has a training session during which he runs forwards and backwards in short bursts. His motion is being recorded by GPS device around his chest in regular time intervals (we don't have information how long they are). Using information from motion diagram make x(t), d_x(t), d(t) and l(t) graphs

Hints:
Lets say we are looking at the moment at the end of 2nd time interval (position -15 units):
x(t) asks: Where are you in regards to 0 reference point?
Answer: 15 units to the left
d_x(t) asks: Where are you in regards to your starting position?
Answer: 5 units to the left
d(t) asks: How far are you from your starting position?
Answer: 5 units
l(t) asks: How far have you traveled until now?
Answer: 35 units

How to draw graphs?
x(t)- from motion diagram (it is what it is)
d_x(t)- same shape as x(t) but has to start from 0, just shift it vertically until it does
d(t)- make d_x(t) non-negative
l(t)- add x(t) parts on top of each other starting from 0 (invert parts when going backwards)

Hope you'll find this useful 🙂



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Kendall Helt
11. July

Average Speed in most questions seems to refer to what I would think of as average speed =d/t See Chapter 2 Problem 18,29,31 Reading Question 87 on page 49 answers average speed as though it is the speed in the middle (v1+v2)/2 . I'm a little hesitant to use the term average speed in this way. Maybe there is a time that finding the speed in the middle is helpful? I would think using the same phrase average speed would be very confusing to students. Thoughts?

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Kendall Helt
15. July

Section 3.7 Example 3.4 page 68. The Force diagram shows a combined force F s-g and the calculation shows a F s+ F g. Would it be beneficial to show these two forces separately on the Force diagram? They aren't happening at the same time, right?
How does this force compare to the force G on H if the shrubbery was not there? I'm not sure how to calculate this. But I think it might be around 467,000 N (calculating the end velocity of 36.54 and estimating a .1 m impressing into the ground which is probably quite high making the F lower than it might really be.
In trying to find an answer to what magnitude of force makes a fall survivable, I found this article for if you really want to go on a side trip 😆 But I couldn't find the answer in it.

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Carolyn Sealfon
20. July

CfP for an AMAZING conference well-aligned with the 2nd ISLE intentionality: enhance learners' well-being!
https://www.cultivatingensembles.org/call-for-proposals
Deadline for abstracts is mid-August; virtual conference is in November. Spread the word!

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David Harrison
2. August

This is in response to "The Case Against Grades" doc by Alfie Kohn that Eugenia uploaded a couple of days ago. You will see that I disagree with a lot of what Kohn has to say. I hope that my efforts will stimulate a useful and respectful discussion.

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Yuehai Yang
2. August

At least some ideas to wrestle with following our earlier discussion... A confession here: I really disliked the teaching evaluation "grade" system (no matter how reasonable/detailed it has become), feeling that it has discouraged me (as a learner of teaching) from taking risks and reforming what I did. In retrospect, I should have considered the same feeling more from my student learners.

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Eugenio Tufino
7. August

A few days ago I was puzzled by Danielle Buggé's comment about her teaching physics topics from mechanics to electromagnetism in a single year of high school. One of the reasons was surely due to my not knowing well the American school system and how physics teaching is offered there in the upper grades. I think such knowledge is important for those who do not teach in the US to have a good understanding of the context in which ISLE is mainly offered. So far I have not had a chance to study that context systematically, so I asked Danielle a few questions about how physics courses are offered, including even AP

courses. Danielle was very kind and gave me some very helpful answers, which I think maybe might also be of interest to other members of the group who do not teach in the US but in other part of the world (we are many now!). So rather than reporting her answers, I invite Danielle to write about them here. 🙂

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Marci Herndon
8. August

I'm hoping someone can help me - I ordered the textbook plus Masteting Physics for my AP Physics 1 class this year, but wasn't sent student access codes for the online portion. Is there some other way to access it or do I need to get back in touch with the company we ordered them from?

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Zach Greaney
10. August

Hello, I am one of the new members wondering about curriculum for 9th grade physics. I've noticed that within the free resources there is not as much material in the physics 1 folder. The physics II folder seems to cover everything, but would this be too advanced for 9th graders who are just being introduced to algebra?

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Heather Tuttle Roll
12. August

Could anyone give any suggestions on how to get a sample text and materials?

I have to work through my school and I know that Dana (our new ordering specialist) has been trying to request a sample for over a week. I gave Dana the info in the pinned post by Eugenia Etkina. Dana called me into her office twice this week to see emails she received. She keeps getting replies from different reps at Pearson. Today she has hit her limit with their nonsense. And she transitions out of ordering to our school counselor next week . . .

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Eugenio Tufino
18. August

Hi all, I came across this oral history interview with Eugenia Etkina by the American Institute of Physics, it contains many interesting insights on ISLE and other aspects, here is the link: https://www.aip.org/.../niels.../oral-histories/46808…

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Christine Russell
24. August

Hello all! I am looking for suggestions on how to teach Interrogation of the textbook. Other than having the students read the relevant sections in the text (or following OALG Activity 1.6.1 and 1.6.2) I don't know how to present it. I did it last year but it didn't seem to be very effective. (I know I also waited too long into the semester.) I'm looking for ideas and suggestions as to how to teach them the proper way to learn from the textbook. Thanks!

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Rebecca Kung
29. August

My husband found a possible "need to know" for kinematics:
A woman was charged by a car rental company for driving her rental car 36000 km in three days. She would have had to drive 500 km/h for 72 hours, which is not conceivable. I think my high school students would find this amusing.

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Tom Prewitt
31. August

There are so many wonderful resources available for ISLE and the textbook that I sometimes am challenged to find one I know exists and other times wonder if there's one I should be using but haven't found. Now I am looking to see if there is an equivalent active learning buide for the parts of the introductory material. I have the material on the non-science experiments (cameras, tennis rackets, etc) and on the science examples (condensation on glass, balloon popping, etc). What else should I cover in the first 2-3 lessons - units? estimates?

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Dawn Hanik
1. September

Hi everyone. How much time do you spend in chapter 2 on section 3 (operations with vectors)? This is my first year using the textbook and I'm wondering if I should do this section here, save it for later, or touch on it now and do more in depth later on.

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Penny Shrum

3. September

Hey guys! I Could use our hive mind. I have to write an assessment for HS-PS4-2 and HS -PS4-5. So … information digital transmission and storage over analog, as well as device capture and store of info using wave behavior and it's interaction with matter. I am brainstorming phenomenon right now. I have come up with cell phones, solar cells, and maybe medical imaging? Any other recommendations? or anyone already do something with these two?

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Koelia Biswas
4. September

Hello Hive,
Planning a Science Fair for 11-14 year old. This time we are contemplating letting students create a model on the day of the fair itself and present it. However, I am running into the difficulty of choosing model(s)/ experiment(s) that will have a fair balance in all sciences. The overarching theme of the Fair would be globalisation and sustainibility.
Seeking ideas and suggestions here.
Thank you.

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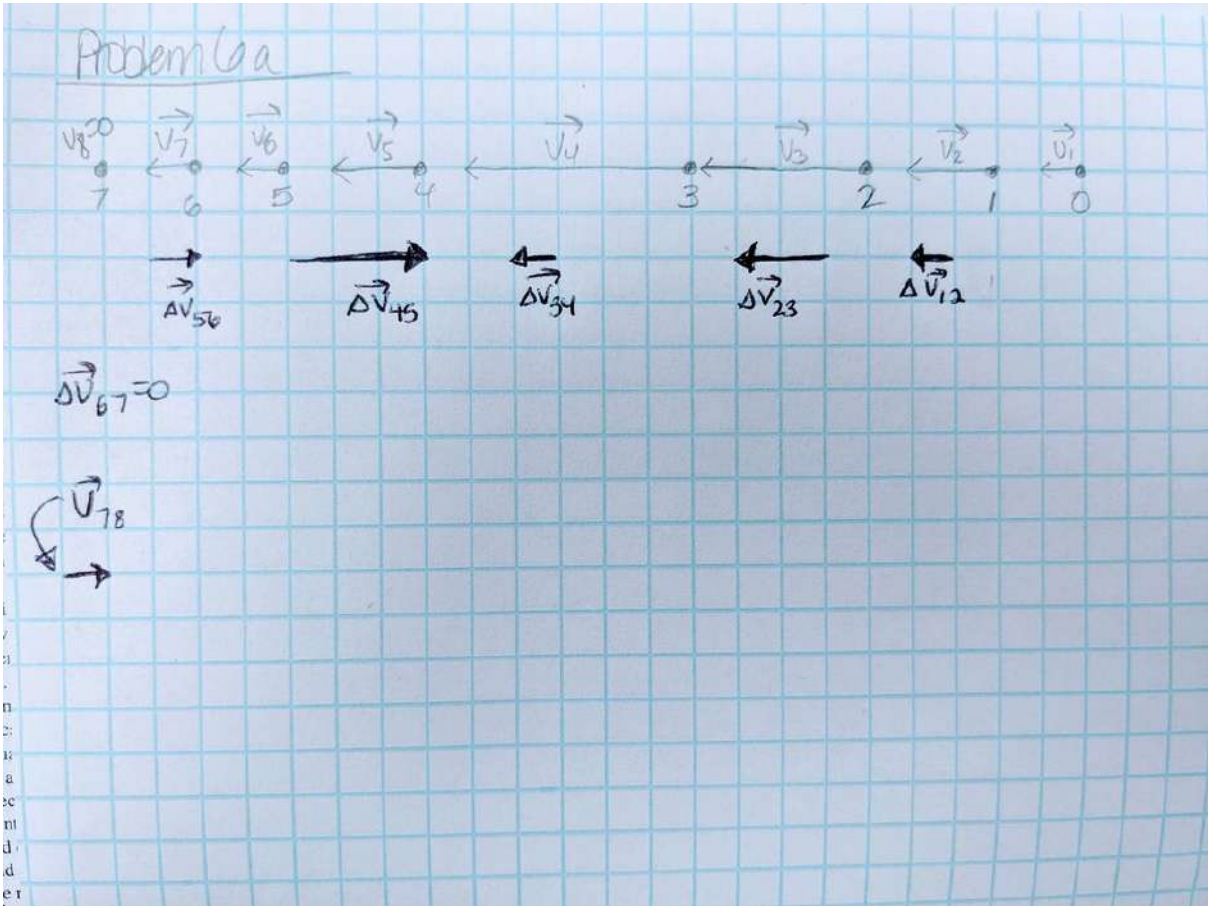
Dawn Hanik
6. September

Hello! I'm working on chapter 2, problem 6a on page 45 of the text. I did it on graph paper so that I can determine the lengths of the delta V vectors accurately. Just wondering if I did this correctly as the delta V 7-8 vector in the manual is one box in length facing left. I got one box facing right because the final velocity, V8, should be zero. Thank you in advance!



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Stephanie Hunt
8. September

Is there anyone here that would be willing to share their year at a glance for an on level algebra based physics class? I am starting this approach this year for the first time and don't really have a sense of timing. I teach 48 minute periods every day. TIA

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Anne L. Caraley
10. September

Good evening.
After several weeks of doing a planned review of vectors and universal gravitation with my College Physics II students, we got to do observational experiment 17.1 (videos with the balloons) to finish out the week.
Outcome: they want to see more testing experiments!
They have discussed things and agreed as a group that there are two “flavors” (I didn’t let them say “charge”), but also think that more “flavors” have not been ruled out.
I suppose on Monday, if it isn’t still painfully humid out, I’ll track down the old pith balls and wool and fur and silk and plastic and the plastic and glass rods and turn them loose.
Perhaps also some aluminum foil and a metal rod?

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Nathan Spear
13. September

Question on a HW problem:
Chapter 15, Problem 5:
"Air in a cylinder with a piston and initially at 20 *C expands at constant pressure...
...suppose that the work leads to a corresponding change in thermal energy (there is no heating)..."
Aren't these two statements at odds? The first suggests an isobaric process and the second suggests an adiabatic one.

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Frank Noschese
13. September

I have a question about the difference between observational experiments and testing experiments.
I have a student who wants to find out how the temperature of the water inside a cup affects how much water condenses on the outside of the cup. Is this an observational experiment or

a testing experiment? The student and I think it could be either one, depending on how the experiment is worded.
Observational experiment design: The student will pour equal amounts of water with different temperatures into cups. Each water cup will be placed on a balance and the increase in mass after a given amount of time will be recorded. The student will observe how different temperatures have different mass increases.
Testing experiment design: IF the temperature of water affects the amount of condensation on the outside of the cup, AND we pour water of different temperatures into cups that are on balances, THEN we will see different increases in mass.
Could it be both type of experiments? Or is it really one and not the other? Thoughts?

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Jane Jackson
13. September

Do you teach AP or 2nd year high school physics? If so, do you want an examination copy of Eugenia Etkina's textbook on ISLE, "College Physics: Explore and Apply" ?
ISLE and Modeling Instruction are super-compatible (in Eugenia Etkina's words); and many modelers use her textbook.
I learned the following (from a Savvas employee's summer 2022 post to Eugenia Etkina's Facebook group).
Pearson programs and samples for the K12/HS market need to come through Savvas (not Pearson! Savvas is a partner of Pearson.)
Any K12/HS customer can contact their Savvas Account Manager for samples. Use the following URL to find your direct contact.
http://www.savvas.com:80/findmyrep
Savvas is the team/company to provide sales and service for Pearson programs.
Here is what Savvas would need to know:
Customer Name
School Name
District Name
School Mailing Address (full)
Customer email
Customer phone

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Dennis Seda
17. September

I just got a private tutoring job for an 8-year old. The mother insisted that she learns physics without the heavy algebra (as she still hasn't learned it).
I am planning to use all the thing I've picked up from Eugenia Etkina and the rest of the group. Wish me luck!

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Frank Noschese
17. September

OK, one more question about observational experiments and testing experiments. In the past, I've done the traditional pendulum lab in 2 parts.
Part 1: Design an experiment to determine which factors (mass, angle, length, etc.) affect the period of a pendulum.
Part 2: Now that you've determined that only the length affects the period of a pendulum, design an experiment to determine the mathematical equation that relates length to period.
My assumption is that Part 2 is an observational experiment, since we just trying to find the mathematical pattern in the data.
But what about Part 1? I think this is also observational. But could it be a testing experiment if worded differently? For example: IF the period of a pendulum is affected by mass, AND we measure the periods of pendulums with different masses, THEN we will see different periods. (And of course, many of my students would likely say it is a testing experiment regardless, because we are "testing" different factors to see if they affect the period.)
Thoughts? Thanks again for everyone's input! (And patience!)

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Gorazd Planinsic
19. September

Yesterday Eugenia Etkina wrote about why all objects fall with the same acceleration. At the end of the post she talked also about the proportonality between the inertial and

gravitational mass , as one of the topics suitable for more advanced students. I am posting here a new activity (with solutions) that Eugenia and I designed that addresses this topic.

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Gorazd Planinsic
20. September

Yesterday Eugenia Etkina wrote about why all objects fall with the same acceleration. At the end of the post she talked also about the proportonality between the inertial and gravitational mass , as one of the topics suitable for more advanced students. I am posting here a new activity (with solutions) that Eugenia and I designed that addresses this topic.

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Were Ogweno Were
20. September

I'm looking for an activity/activities (virtual) to do with learners on Newton's laws of motion, I've gone thru quite a number of posts and files here but couldn't find one, does anyone have a clue about this?

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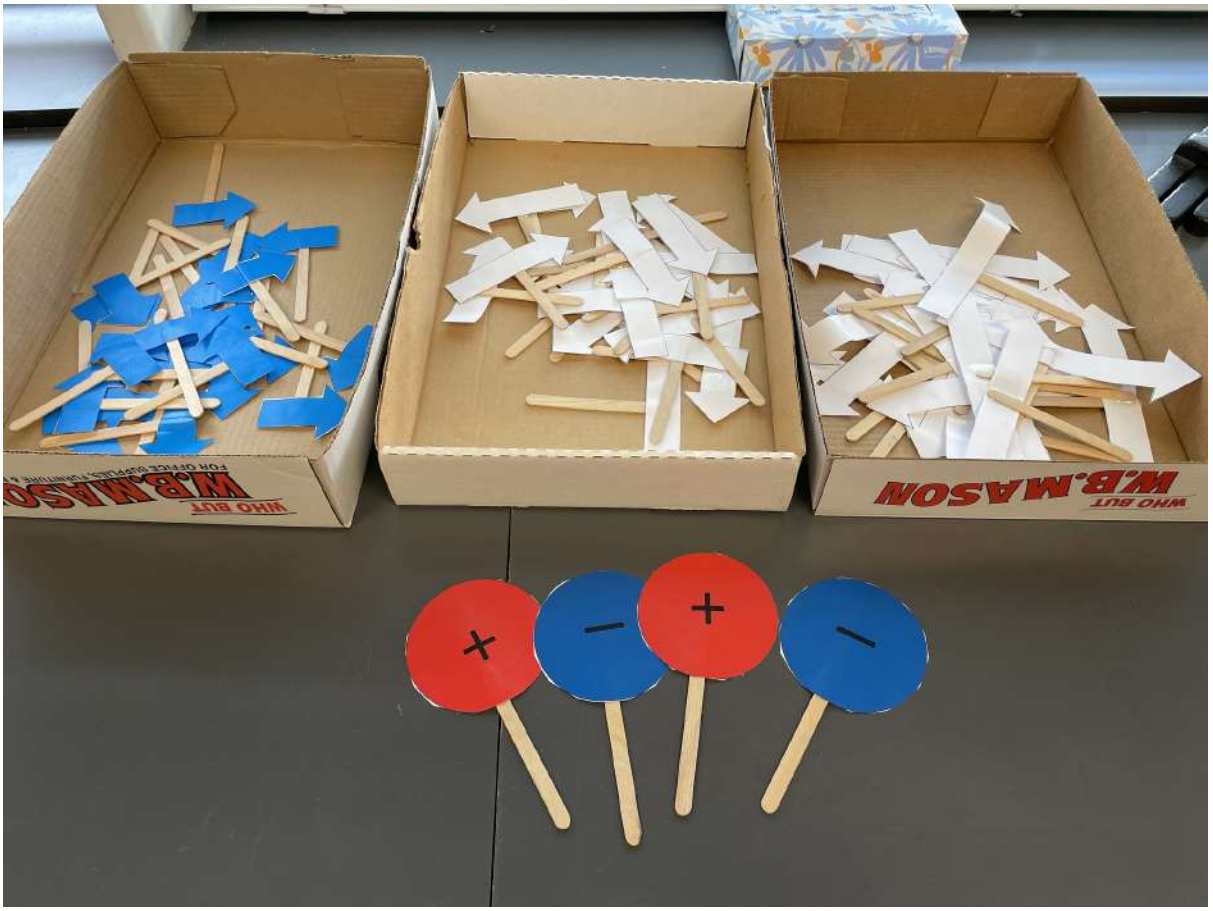
Were Ogweno Were
20. September

Which site has online simulation on Newton's laws of motion?

https://www.facebook.com/groups/320431092109343/posts/1255357651950011/?__cft__[0]=AZVycvb2fwTv-8HlPMUOodHvsk9cMjZ-h_aH3zBVGQu4xcR4HkHzRd3R0oXSAz0pjdYtnOh8_Oxkx4vSiYPkkW7uhRSh0kDDFX457Ww-B1ktXpxxVuOJoF6k_KH5a2GEC9KS5srJ-h8kDnSsTihzXSodVfQuWpps7Kz1wdf5LjJnNJ6oGnnN6PM2w1VWETU_HJU&__tn__=%2CO%2CP-R

Frank Noschese
21. September

I used a set of paper arrows for the first time today! We used them to visualize the electric field around charges. It worked so well! (Note: I didn't have enough time or cardboard to make cardboard arrows like Eugenia Etkina uses. So I printed arrows on paper and had the students cut them out and tape popsicle stick handles to each one.)



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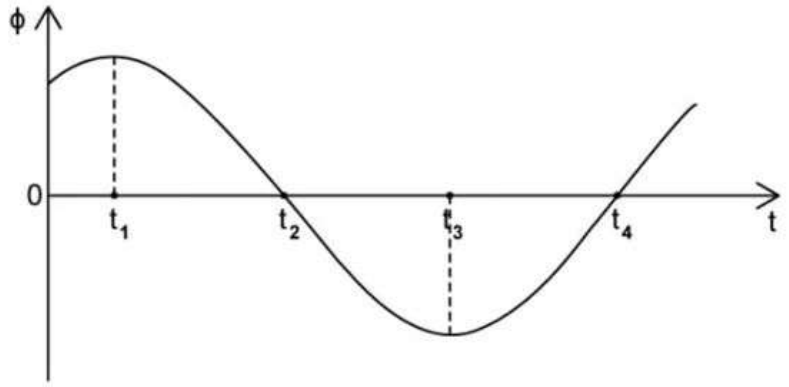
Were Ogweno Were
22. September

Can someone help with this question, the answer is C, but how? Isn't minimum EMF at T1 and t3 ?

A coil rotates in a uniform magnetic field. The graph shows the variation with time t of the magnetic flux φ through a coil.



Determine the times when the magnitude of the induced emf measured across the ends of the coil is at a minimum.

A. t_1 only

B. t_1 and t_4

C. t_2 and t_3

D. t_2 and t_4

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Oliver Moose
22. September

Hi, does anyone have good MODERN resource for AP assessments? I am using old practice exams, but know the style (and content) for AP1 has changed. Thanks!

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Bor Gregorčič
23. September

Saw this video by accident ob FB and thought it might be a good "need to know" generating video for the topic of refraction 🙂 I have this habit of seeing stuff online and immediately thinking: Oh, I can use this in my class!
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Rob Mason
27. September

I want to have my classes do a position-time linearization by dropping a basketball ball under a Vernier motion detector (basically 2.7.1 in the ALG), using Graphical Analysis 4. However, I have tried it several times, and I cannot get a result in which the position vs. time squared graph is linear. It still has what looks like a parabolic shape, AND the best-linear-fit has a slope of around 2.5 m/s^2. It SHOULD be around 4.9 m/s^2...right??

Furthermore, when I analyze the velocity-time graph for the same section, the slope comes to around 10 m/s^2, which of course is totally expected. When I apply a quadratic curve fit to the same segment, it gives me the expected "a" value of close to 4.9 m/s^2.
Any ideas? Is there something about the motion detector or Graphical Analysis algorithm that is messing with my results? Am I making a silly mistake? I know I have done this before, but have never gotten results like this.

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Tom Prewitt
28. September

I have 2 classes of regular high school physics and am using the lessons from PUM Physics II. We are moving slowly and have completed Kinematics lessons 1, 2, 3 and 3a. I want to give my students an assessment and focus on multiple representations (dot diagrams, pvt graphs). What is the best way to do this?

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Dawn Hanik
4. October

Is there a file of chapter 4 of the text marked up, similar to the chapter 3 file of the textbook chapter, marked up available on this page? I find this very helpful.

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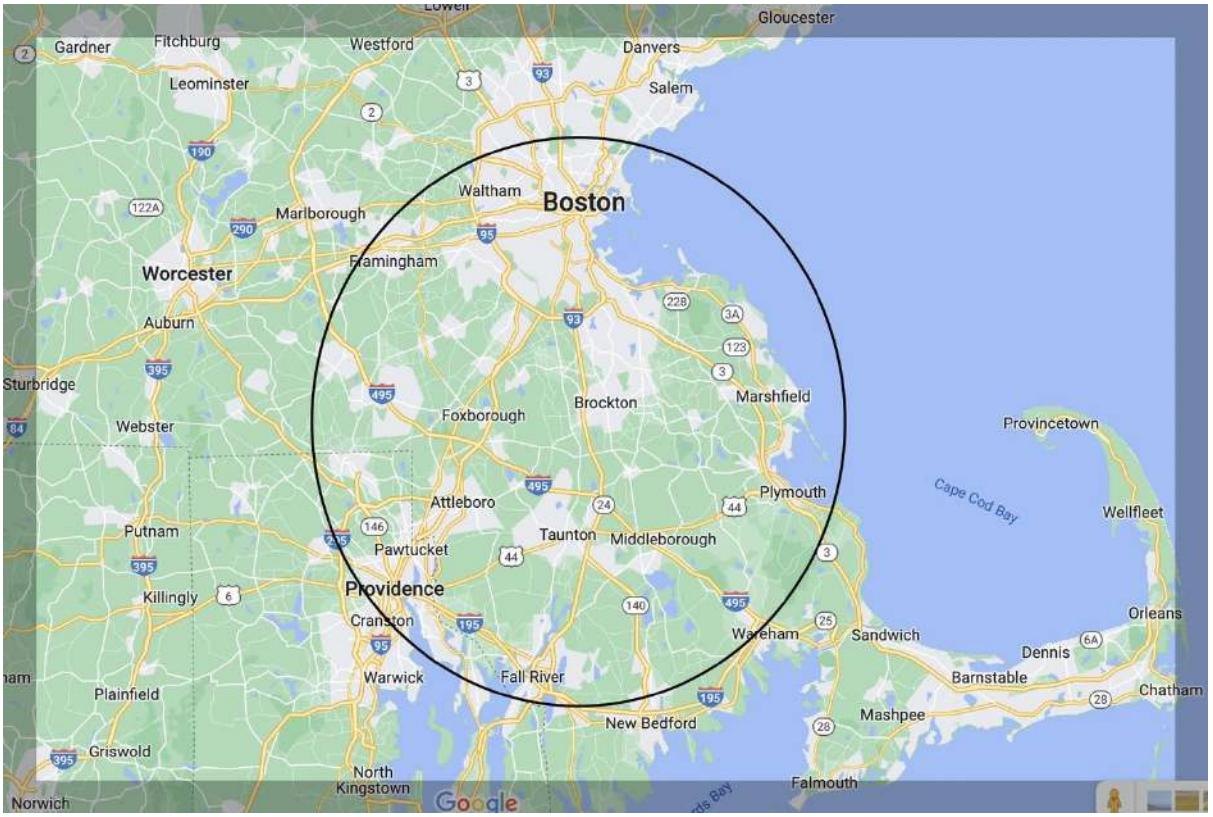
Allison Daubert

6. October

I'm looking for a few more amazing physics teachers who are teaching with ISLE or would like a student teacher who will be teaching with ISLE. If you happen to teach in Southeastern Massachusetts, are tenured, and want a student teacher who is fluent in ISLE, please PM me to talk!



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Rebecca Kung
11. October

Does anyone have resources for teaching students how to write lab reports? Turns out, my 9th graders have never written a lab report, and it shows. I know there are ISLE rubrics, but my students need more help than that. I was considering starting by giving them a draft report and having them correct or comment on it, but I'm not even sure that they could succeed at that.

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Allison Daubert
14. October

Speaking of habits and routines, like many here, I've assumed Eugenia Etkina's habit of asking my students to say what they've learned today before leaving my classroom.
I was being evaluated by my department chair today, and he was leaving the classroom a bit before class ended. I interrupted my students working and said "Everybody, Dr. X is leaving for the day. Is there anything you want to ask him?" Without missing a beat, a student said "Oh, Dr. X, you can't leave yet. What did you learn today?" It was a wonderful moment where students had a chance to validate the importance of our classroom routines and also hear what a professional physicist learned during the class. My colleague was gracious enough to share that he learned that including the earth in the system when talking about gravitational potential energy clarifies the physics.
A student shared that she learned the importance of our 'what did you learn routine' and asking it even of visitors to the classroom - even those with PhD after their name. She shared that it was validating to see that everyone learns and that there's an expectation that everyone who sits in the classroom learns something each day.

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Frank Noschese
14. October

We started motion this week. In previous years, we would jump right into the traditional constant velocity buggy lab (i.e., collecting and graphing position-time data for fast and slow buggies). This year we started with acting out a relative motion story (ALG 2.1.1). Lots of good conversation!
Then we used plastic chips, fast and slow buggies, and a metronome to begin exploring dot diagrams. Followed up with a dot diagram made by a ZeCar speeding up going down a ramp made from a whiteboard and then slowing down after leaving the ramp. (ZeCars are nice because they accelerate slowly.) Then we added velocity vectors to our dot diagrams, using arrows cut from card stock.
Finally, we explored velocity change vectors. As we worked through ALG 2.2.5, a student ingeniously stacked the velocity vectors vertically from v0 to v3. It made it so easy to compare and draw the velocity change arrows for v0 to v1, v1 to v2, and v2 to v3 in succession and to see they all point in the same direction!
If you have any trepidation trying out the activities, do it anyway! Even if you think it's silly (like acting out stories) or that students will struggle (like velocity change arrows). You will be surprised by the resulting conversations and what your students can do!

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Gorazd Planinsic
21. October

I am following up on Eugenia Etkina post about Jeopardy problems. I am posting a "process jeopardy" problem from magnetism (with a solution) that requires from students to propose processes that could lead to a specified outcome of the experiment (in this case represented as graphs).

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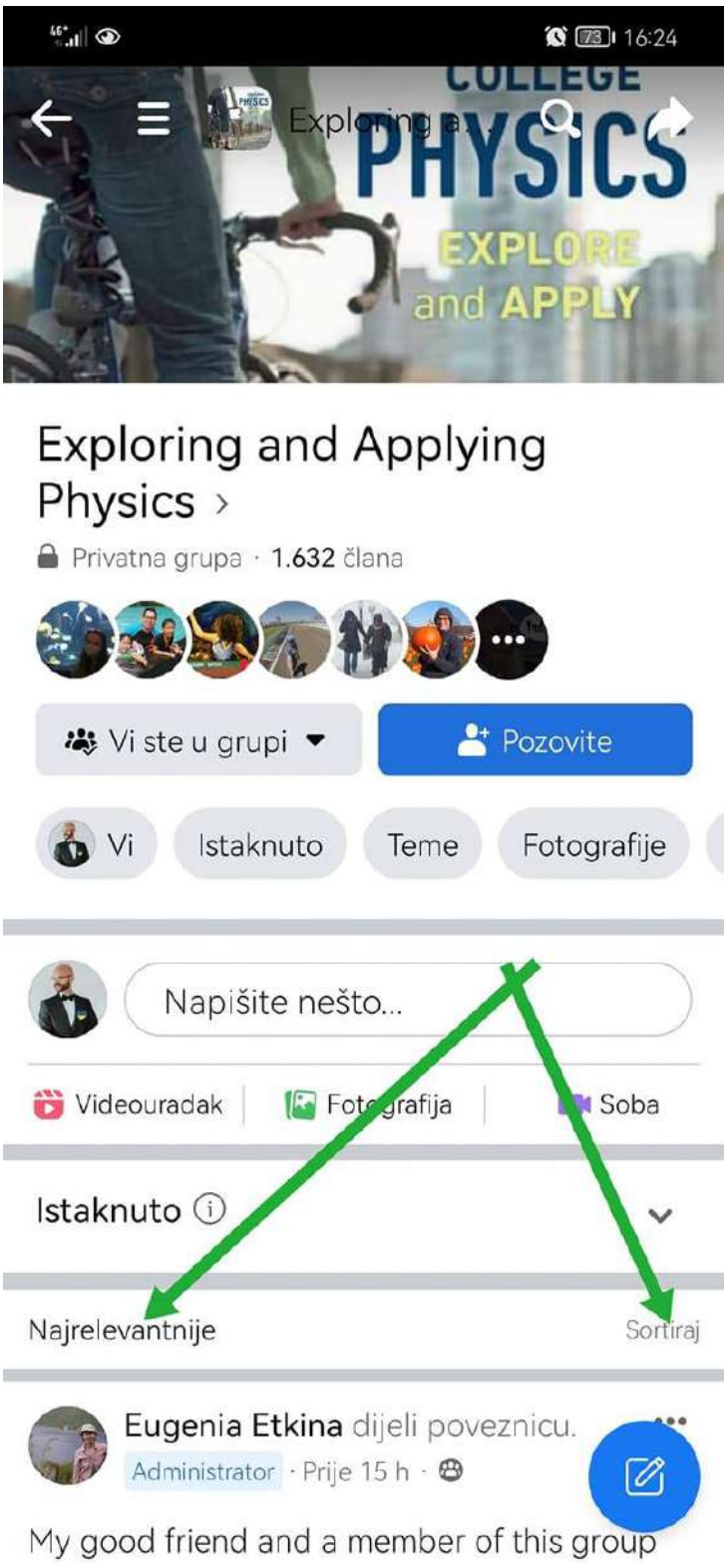
Hrvoje Mihaljević
22. October

In case you didn't know (as I haven't until few days ago) there is a sorting option for posts. You can choose how posts are arranged:
- most relevant first
- last activity first
- newest first
Hope you'll find it useful 🙂



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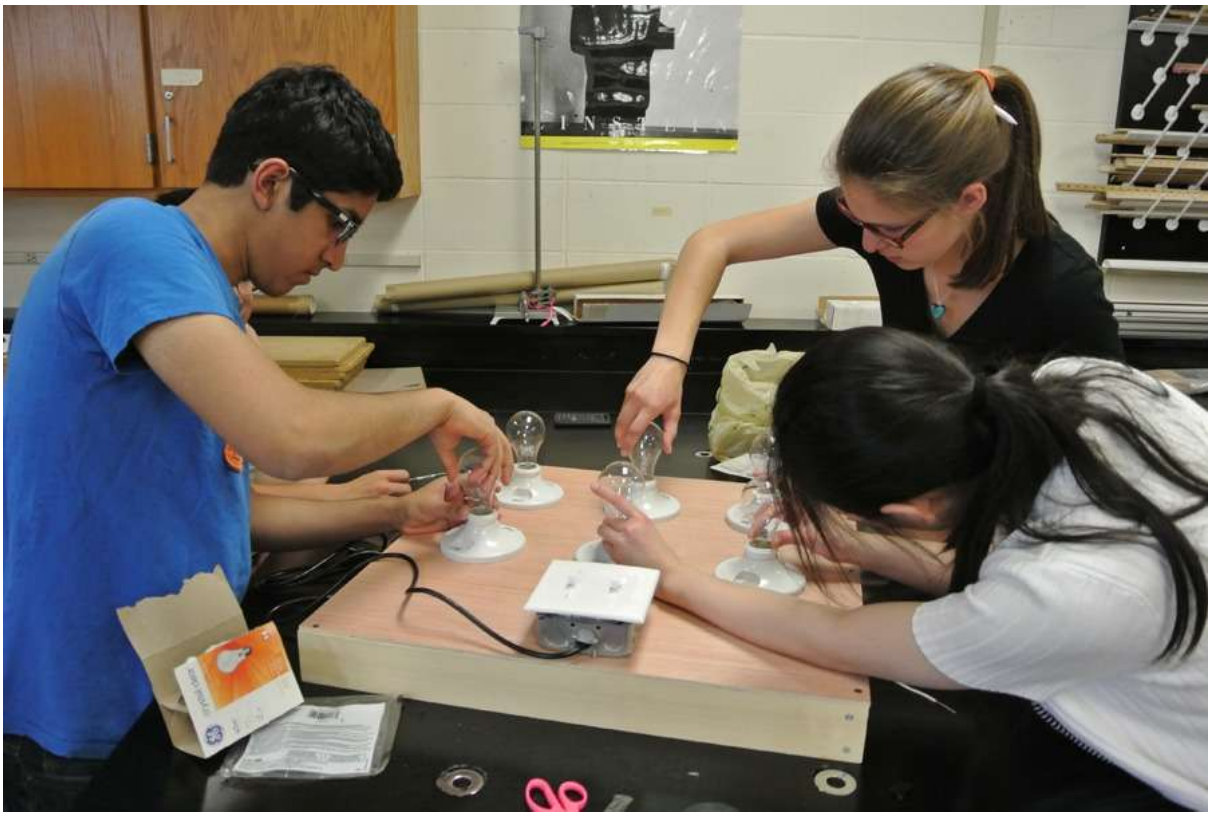
Tom Prewitt
23. October

What's the best way to teach the abilities - specifically, "the ability to design and conduct investigations (test experiments)?"



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Hrvoje Mihaloža
24. October

Few days ago Jane Jackson mentioned in a comment of one of Eugenia's posts articles on inquiry teaching approach in biology by Anton E. Lawson.
Articles can be found online, I've found almost all of them. Articles discuss the learning cycle, hypothetico-deductive reasoning, not proving but getting more confident in some explanation...but in the context of biology.

I think these articles can be very useful in spreading the ISLE approach to teaching to biology teachers so I've added link to Anton E. Lawson's home page (https://www.public.asu.edu/~anton1/index.htm) in our google folder with posts and meetings (it's under "Other ISLE resources"- "Biology- Anton E. Lawson's home page", https://drive.google.com/.../10qn...).
I've picked two parts from article named "How good are students at testing alternative explanations of unseen entities?" from year 2000. to get you interested 🙂
If you have trouble finding articles send me an email at hrvoje.miloloza@gmail.com
Hope you'll find this useful 🙂

How Good Are Students at Testing Alternative Explanations of Unseen Entities?

Anton E. Lawson Nicole Drake Jennifer Johnson
Yong-Ju Kwon Christopher Scarpone

THE purpose of the present study is to test the hypothesis that a fifth stage of intellectual development characterized by the ability to test alternative explanations involving unseen theoretical entities exists. This fifth-stage hypothesis will be tested in the context of a nonmajors, college-level biology course in which the assumption is made that some, but by no means all, students have acquired stage-five reasoning skills.

Jean Piaget's well-known developmental theory proposes that the development of thinking skills, which most would characterize as ``scientific,'' takes place in a stage-like fashion. Stage one, the sensory-motor stage, lasts from birth to about 18 months. As the name suggests, the stage involves the development of sensory-motor knowledge and acquisition of practical knowledge such as the fact that objects continue to exist even when out of sight. Stage two, the pre-operational stage, lasts until seven years of age. This stage primarily involves development of the ability to speak and understand the spoken word. Stage three, concrete operations, which begins at age seven, involves the development of descriptive thinking skills in which the child acquires an under-

variables such as pendulum weight, string length, and release angle on swing speed, s/he is classified as formal operational.

An important point in terms of the present study is that the pendulum task characterizes stage-four thinking by the presence of a hypothetico-deductive thinking pattern. In other words, to test the hypothesis that weight differences cause differences in swing speed, one generates the following argument:

If ...	differences in swing speeds are caused by differences in the amount of weight hanging on pendulums (hypothesized cause)
and ...	the weights are varied, while holding other possible causes constant (proposed experimental test),
then ...	the speed of pendulum swing should vary (deduced expected result).
But ...	when the proposed experiment is actually carried out, we find the swing speed does not vary (observed result).
Therefore ...	changes in swing speeds are probably not caused by weight differences (conclusion).

Piaget's theory implies that all formal stage tasks

Another problem is that many instructors are so concerned with content coverage that they are hesitant to take the necessary time to discuss hypothesis and theory testing. Also, the lab is often thought of as a place to verify lecture claims rather than to conduct "real" inquiries. In hopes of solving this problem in our nonmajors course, we try to make sure that topics arise in labs prior to lectures; and we no longer try to closely articulate lab and lecture topics. Thus, when students need two or three weeks to conduct a particularly difficult inquiry, we can allow them the time to do so. In this sense, we try to keep the American Association for the Advancement of Science's central teaching principle in mind. It states: "Teaching should be consistent with the nature of scientific inquiry" (AAAS 1989).

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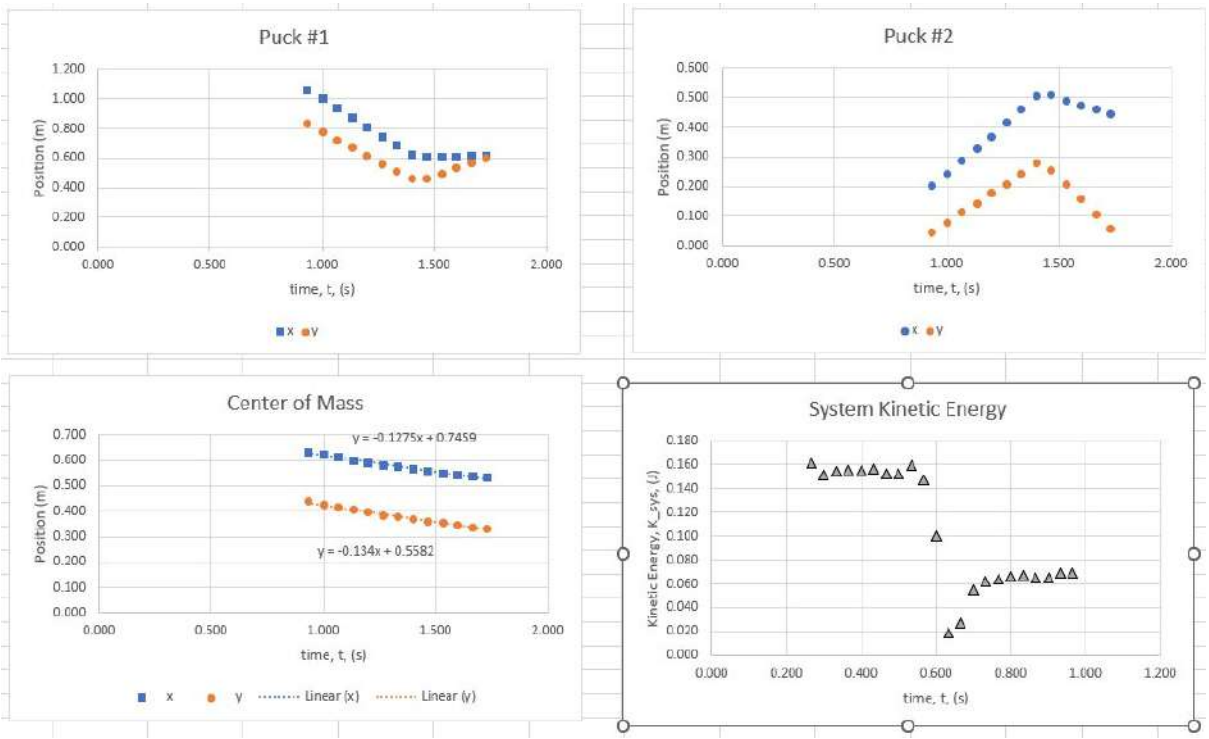
Melissa Vigil
26. October

My class tested the motion of two pucks and the center of mass using video analysis. Here is some sample data. It was interesting to see the bit of elastic recoil while the foam bumpers around the edge of the hover pucks compressed. We also had a good discussion about the momentum exchange between the pucks and the lack of exchange with the environment.



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Andrew Yolleck
29. October

Hi everyone, my former position at Elizabethtown College is open for applicants. When I was there, the relatively small class sizes made it a great opportunity to implement ISLE at the college level (although larger class sizes still work for ISLE too!). Please help spread the word if you or someone you know might be a good fit. Feel free to reach out to me directly if you would like to discuss further. Below is the job description and the link to apply. Thank you!
The School of Engineering, Math & Computer Science at Elizabethtown College is looking to hire innovative faculty using evidenced-based teaching practices in support of our growing programs and increasingly diverse student body. We invite applicants for a non-tenure track Lecturer in Physics. This is a full-time, 10-months per year position, starting August 1, 2023. Please see details and apply at: https://etown.peopleadmin.com/postings/4613

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Ilya Yashin
30. October

Supplement to "expert activity"
https://youtu.be/5eW6Eagr9XA
This excellent Veritasium video reminded me of the "expert activity" that I've learned from Eugenia and love so much (credit to Yuhfen Lin and David Brookes; see this post and comments for more details https://www.facebook.com/.../permalink/1031439961008449/)
I don't think the video should replace the expert activity; I think the video would be great either to watch together in class after the activity, if time allows, or at least to assign/suggest for watching outside of class.

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Yuehai Yang
1. November

Have a question here. My institution has been pushing quite hard for "undergraduate research". I wonder, from your perspective, what constitutes research, especially at undergraduate (or high school) level. Does conducting an observational experiment to observe a novel phenomenon do it? Add a hypothesis to the observation? Or is it necessary to have some proposed hypotheses to start with (for test-design), to be called a research project? There might not be a fixed answer...Just hope to collect some thoughts from the hive mind.

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Sheehan H Ahmed
2. November

Here's a recent, real-life example of circular motion and how acceleration depends on the speed. Might be a good point of discussion / need to know for students.

In order to go much faster than his opponents, the driver drove his car pressed up against the outer barrier, thus allowing himself to drive much faster than what would just be possible if the only centripetal force was the frictional component of the force the surface exerts on the car.
With this extra force exerted by the barrier on the car, the driver was able to overtake a significant number of other racers at the last moment...at the cost of damaging the car and probably getting a new rule enacted banning this kind of move in the future.
(obviously ignore the standard talk about drivers needing to "brake to counteract forces that push their cars toward the outside of the track.", which is a bad way of putting it even if you see it from the non-inertial frame)

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Ashutosh Bhakuni dijeli poveznicu.
6. studeni u 07:49 ·
Hello
Question on electrostatics: insulators, conductors and flow of electrons.

Kathy Joseph has a wonderful channel channel on history of electricity and has recently published a book Lightening Tamers (not available at my place yet). I had seen her video on Stephen Gray where he discovered electricity could flow. In the video she shows a thread ‘packthread’ (jute/ wool?) attached to a cork fixed to the end of a pvc pipe that is rubbed. The pvc pipe is rubbed yet the ball of thread at the end attracts a very light feather. I am unable to figure out how this is happening? Charges are flowing from pvc to the cork and the thread, even though they are not metal conductors? As per video Stephen Gray used a stick (wood?) and an ivory ball attached to its end. How does that work too?
Kathy video:
https://youtu.be/UCGIBBTvUuk
We tried the same- rubbed wool on pvc pipe, tied a wool thread on the pipe, attached a aluminuim foil covered ping pong ball to the other end of the thread…after rubbing the ball attracted the feather. We didnt try with wool ball (yet). It’s not a strong attraction; but the humidity was also not low.
https://drive.google.com/.../1idpKxctQUNnnU5h0EHA.../view...
I am guessing pvc and thread are not perfect insulators, but can the electrons flow such distance through them? Is some induction effect happening?

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Carolyn Sealfon
7. November

Cultivating Ensembles 2022
Check out the schedule for this interactive, virtual conference this Thursday and Friday focused on building ensembles and inclusivity in STE(A)M. Hope some of you can join us!

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Dawn Hanik
8. November

Hello! I am looking for pointers/tips on helping students realize that there is a parallel and perpendicular component to friction. I want to do the ALG 4.3.1 with them, but I have students in my AP class who I had for honors physics last year, where I used The Physics Classroom resources. TPC does not really go beyond the fact that friction opposes motion and then gives them the equation to find friction force. I anticipate that my 2nd year students will struggle with coming up with the force diagrams in this activity 4.3.1. They could surprise me, but I want to know what to do if they struggle. They are already saying "What

happened to Fgrav, why do we have to write out Force Earth exerts on object"? LOL Thank you, in advance, for your help.

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Paul Wolf
8. November

I am having my astronomy kids do a "mini report" on some astronomy topics that we don't have time to cover more fully. I am having them describe how these astronomers went from "observation" to "hypothesis" to "test." I was reading a draft for one of my students on the Cepheid variable stars. We had talked about what this graph of Henrietta Swan Leavitt's original observational data showed, log of brightness vs period. In their narrative they said this data "demonstrated that brightness is related to the period."
Technically they are probably correct that's what the graph shows. However I thought this was a good opportunity to point out to them that it's likely that Leavitt had no idea that the relationship would exist *before* she took the data, graphed it a few different ways, and thought about it for awhile.
Recently someone in here said that over time students learn that they are expected to know the answers to the problems we pose to them already. This interaction made me think that they might end up believing that's how scientists operate as well, and it makes me wonder what the rest of the narratives will say in this regard.

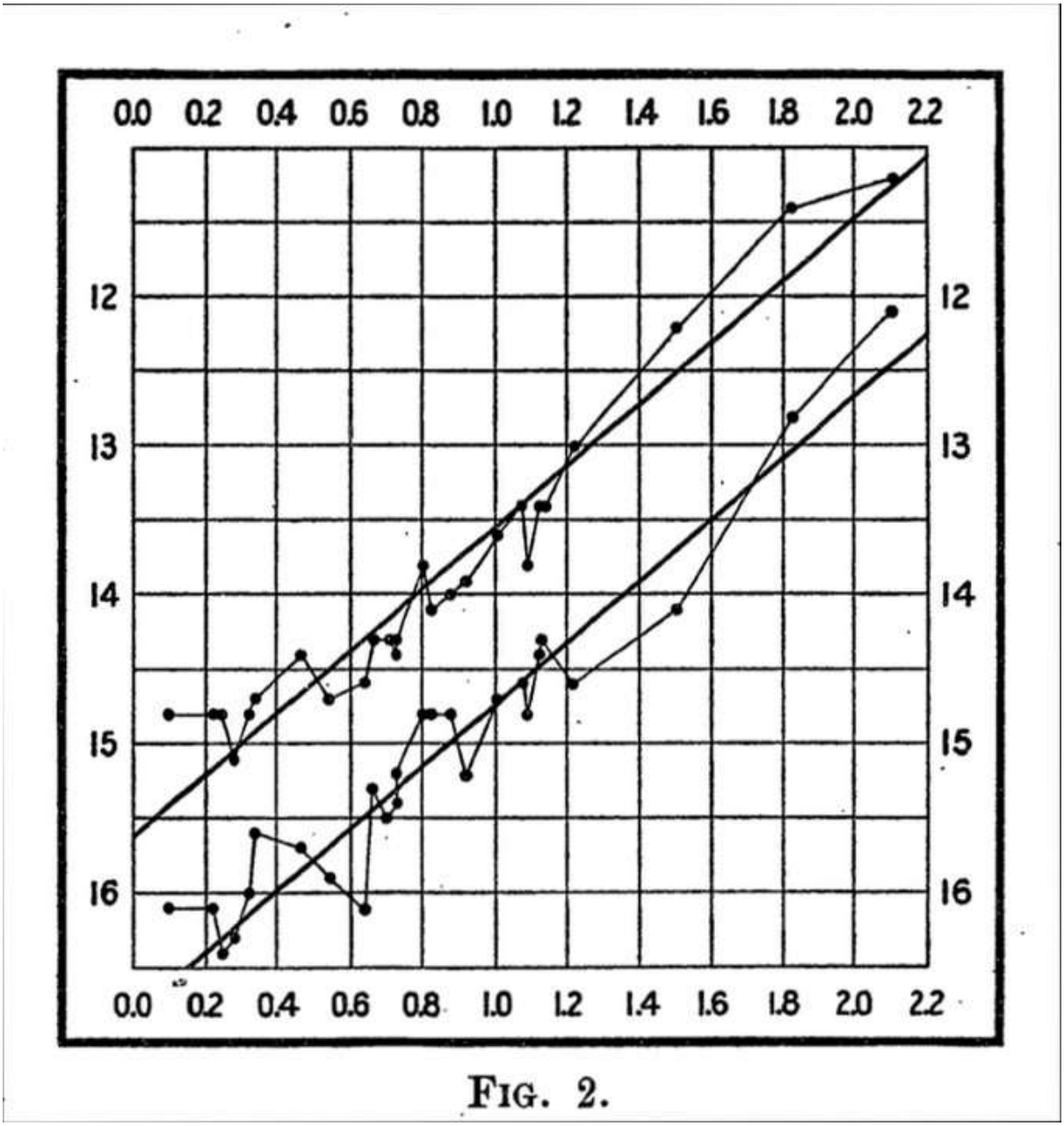

FIG. 2.

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Paul Logman
12. November

Could you summarize the similarities and differences between the modeling instruction approach and your approach?

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Phyllis Rogg
19. November

ISLE at work
This week with one of my classes we were able to join a live tour of the Vatican Observatory that happened to be streamed during my Honors Chemistry class. We were able to type a question in for the chief astronomer Brother Guy Consolmangno. His answer reminded me of the ISLE approach. My students asked what the most awesome thing was he had seen in the telescope. He answered without batting an eye with a quote he said was attributed to Isaac Asimov something like, "Science is not done with moments like Eureka look what I found. Rather Science is done with moments like "Hmmm...that's funny...." " Brother Guy went on to describe a twenty year project he had of looking at transneptunian objects and slowly gathering data to study their properties and behavior. Within that time he and his colleagues came across something unrelated and totally unexpected. That lead to a new finding and area of research. (in fact of that new area, he laughed, since the best most definitive image they had of this also had a long dark line across the image- that of a dead moth's leg on the camera 😉) In any case, I felt this answer was just perfect in showing the progress of science. Here is more on Bro Guy - a Detroit kid 🙂 https://www.smithsonianmag.com/.../guy-consolmangno.../

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Carolyn Sealfon
November 23

Anyone have some good multiple-choice test questions on representing processes involving impulse and momentum using bar charts that they are willing to share?

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Jose Garcia
November 23

What kind of discussions do you have with your students about this topic?

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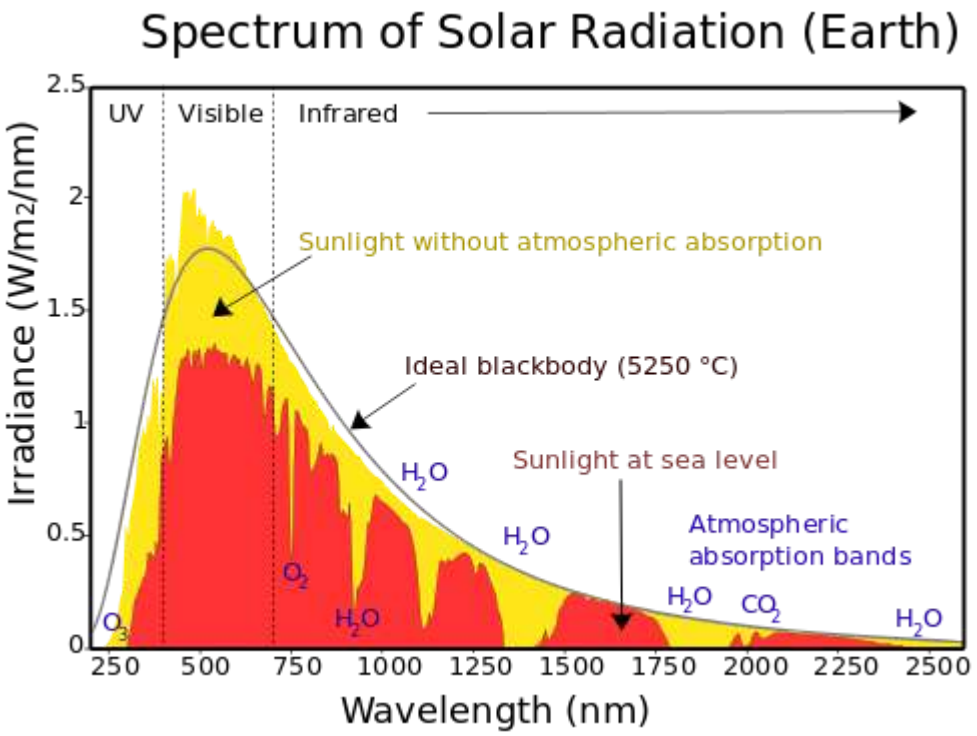
Paul Wolf
November 29

Hi, I have some questions about Astronomy, since I am using some ISLE-style materials to teach that currently. Right now we're doing blackbody curves.
They were asked to use a solar spectrometer to estimate the peak wavelength, then temperature, then the luminosity from the sun. We don't have spectrometers so I tried to find a graph instead. The one at the link below is similar to what I gave them. It gives a peak wavelength that's off by about 50 nm, which throws all the other calculations way off. I found a graph in the Exploring and Applying text I will use tomorrow. Any ideas about why that peak is there to begin with?
https://www.e-education.psu.edu/.../Solar_spectrum_en.svg...
My other question was, in the same day a student said something like "higher frequency means more energy therefore more brightness" when talking about blackbody radiation. It didn't seem fully correct, and I think a better explanation might be "more energy = more energetic photons (higher frequency) + more total photons (brighter)." Does that sound correct? Any analogies that might help bring that idea out?

Thanks!



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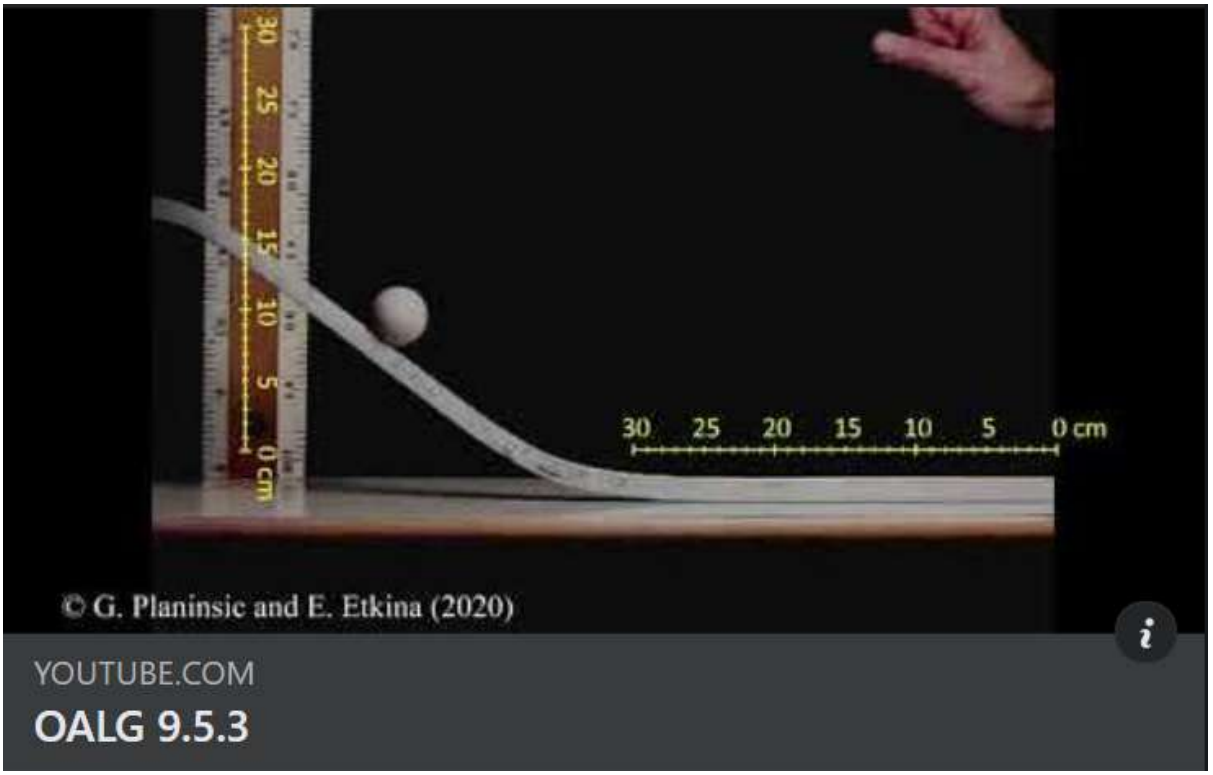
Paul Wolf
December 2

Question about a problem. In the OALG for Chapter 9 we use this video (the link in the doc is for a different video, and I deduced that it was this one instead).
The prompt asks us to predict the max height of the ball using various models of its mass distribution and use that to make a guess about which is the best model for its rotational intertia.
On the video itself I cannot for the life of me get a prediction for the point mass that makes sense. When we assume it's a point, I get a max height of about 9.4 cm. I predict that this should be the highest one I will calculate, but it's way lower than what's observed in the video.
My guess is that my calculation for initial velocity is off? I got something like 1.36 m/s. Wondering if the frame rate change is wonky?



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Carolyn Sealfon
December 2, 2022

What topics or sections do/have you triaged from Ch. 1-11? What is ok to skip? (I still struggle with triaging. I know it is for the best, especially my first time teaching a specific course, but...but...everything is cool & important! 🙂)

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Paul Wolf
December 8, 2022

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Does the ISLE community have any specific advice on helping kids who struggle with trig? I have a fellow teacher who feels their kids are held back by a lack of trig proficiency (even among kids who have had it in math classes) and I wondered if there was any advice I could give. They are not currently using ISLE but are interested.

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Hrvoje Miloloža
December 13, 2022

Very interesting explanation of why we shouldn't focus on procedures so much…

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Paul Wolf
December 13, 2022
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Is there an ISLE-friendly/approved approach to coding or computer science for Junior High/High School?

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Carolyn Sealfon
December 15, 2022 ·

Feedback on lab drafts?
Hi all, I'm working on lab instructions based on the ALG for first-semester mechanics. I imagine everyone is swamped but I thought I'd post just in case anyone is interested or has the capacity to offer feedback. Feedback weclome in the comments, or if you have an

outlook account, I'm happy to give edit/suggesting persmissions. I'll post the link in the comments.

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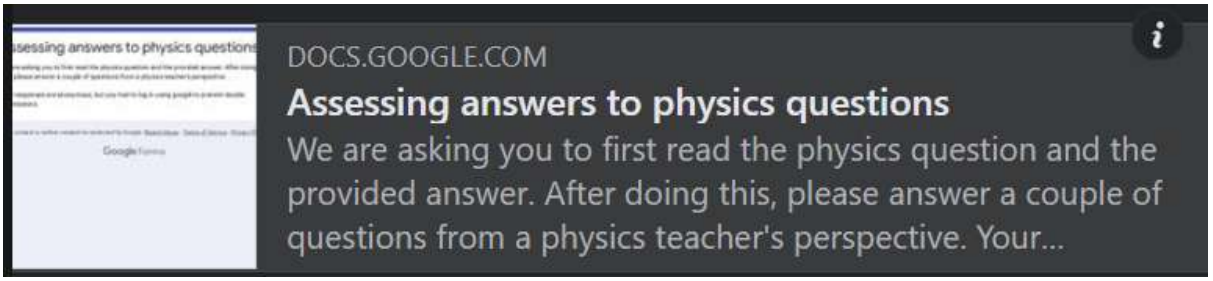
Bor Gregorčič
December 15, 2022
.

Hello folks! I am doing a new exciting research project and I would appreciate immensely if you, physics teachers with different amount and level of experience, could find some time to fill in this survey. I think you will find it interesting. Feel free to spread it to other colleagues as well!
https://forms.gle/zoknynHwGnK9kPhP6

Please like and comment to make it visible for others!



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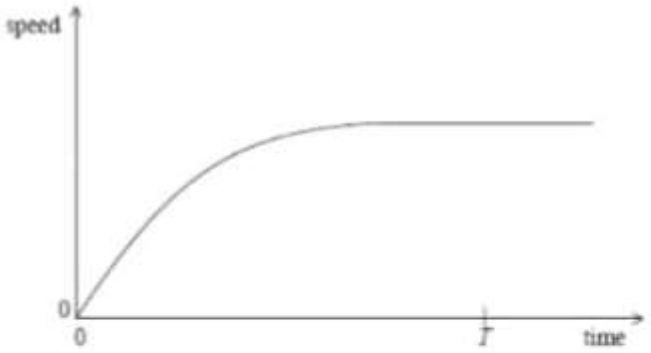
Mohamed Gamal
December 17, 2022 at 1:58 PM
.

Thought that the group would like this

The variation with time of the vertical speed of a ball falling in air is shown below.



During the time from 0 to T, the ball gains kinetic energy and loses gravitational potential energy ΔE_p. Which of the following statements is true?

A. ΔE_p is equal to the gain in kinetic energy.

B. ΔE_p is greater than the gain in kinetic energy.

C. ΔE_p is equal to the work done against air resistance.

D. ΔE_p is less than the work done against air resistance.

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Frank Noschese
December 17, 2022

.

As some folks have pointed out, the artificial intelligence chatbot called ChatGPT isn't perfect at solving physics problems. Here's a question I included on my most recent quiz, which asked students to evaluate the chatbot's answer to a physics question. Sadly, most of my students' responses were wrong or irrelevant. Just goes to show how hard physics is for humans and bots alike!

3. Here's a question I asked ChatGPT, along with its response.

A 5-kg crate is placed on the floor. A 20-kg dog stands on the crate. What are the forces acting on the dog? For each force, state its value, its direction, and the object exerting that force on the dog.

There are two forces acting on the dog in this scenario: the force exerted on the dog by the floor, and the force exerted on the dog by the crate.

- A force of 200 newtons, directed downward towards the floor, exerted on the dog by the floor
- A force of 200 newtons, directed upward towards the crate, exerted on the dog by the crate

What, if anything, is wrong and/or missing from this response? Fix it or explain why it's correct.

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Mohamed Gamal
December 17, 2022
.
Another annoying question

8. Which of the following is a correct definition of work?

A. Product of force and distance

B. Product of force and distance moved in the direction of the force

C. Product of power and time

[redacted]

Grade 10 Physics Work, Energy, Power, Efficiency and heat Formative December, 202

D. Product of force and displacement

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Rebecca Kung
December 21, 2022
.

I am preparing to do some rollerblading physics in the gym right after break. None of my students own any, so I'm gathering my old rollerblades, and about half the wheels have very bad bearings - some stop after half a turn, some stop immediately after spinning. Is this an issue? I'm wondering about taking out the middle two wheels so each rollerblade only has 2 wheels - has anyone tried something like this? I figure for just tossing a medicine ball and getting pushed/pulled, it won't matter to have half the wheels missing.

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Julia Brodsky
December 26, 2022
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On misconceptions... Once I taught a webinar for parents on misconceptions, and here are some excerpts. Please feel free to comment!
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As we start teaching science - or any discipline - to a child, we often assume that we start with a blank slate. However, current research in child development says this assumption is wrong. Even before we start something, we have some predictions on what will happen. In other words, we have a hypothesis, and we have some expectations. Even infants have some preliminary expectations about the world - and get surprised when things do not go the way they expected. The more we grow, the more experience we get - and by kindergarten age, most children already have some solid understanding of the world around them that they observe daily.
It is important to notice that most of our expectations need corrections. And this is how we learn – every time we get feedback that helps us expand our knowledge, skills, and understanding.
And what does it mean to "know", anyway? Can we know anything at all? All phenomena around us are complex and intertwined. All we can do is make human-made models of the phenomena, simplifying them for the needs of the current problem, and to the point, we can operate them. What we can and should understand is why we are using this particular model in this specific circumstance.
As a rule, students have no problem accepting new information that does not contradict their previous knowledge – such as the kids of this age (8-12) are pretty happy learning about

antimatter. But we get into a lot of heated arguments when I say that there is no “up” or “down” in space.
The great thinkers of ancient times had all types of misconceptions – and it is a pleasure to develop courses that create the same kind of thinking conflict for the students.
In our optics course, I tell the students (8-12 yr olds) that ancient Greeks and Romans thought that we emit light by our eyes – as if we had invisible tentacles coming out of our eyes to “touch” an object. Then I ask them how to tell me whether that is right or wrong (oh, what fun it was!)
If asked whether the Earth is still or not, the kids would happily reply that it moves around the Sun - they've learned it in school. Now, what about the Sun itself? Oh, that is an entirely different story 🙂 Most of the kids would come up with all types of ideas trying to defend their thesis that the Sun is still (or, as one boy shared, "just vibrates in place"). Would not it be interesting for you, as a parent or teacher, to find out a) what made them think so? b) why aren't they considering other options? c) how do we make them analyze their own ideas critically?
Playfulness and lack of unnecessary seriousness are important foundations for developing scientific thinking in children. The patterns should be explored and re-arranged. The rules are meant to be created - and broken again. To move knowledge on, ideas should be fragile. A scientific theory should be open to the risks of being wrong.
So, it is important for the students to understand that all our theories are temporal; they will change with time. They also need to realize that all our knowledge is imperfect. When they know that, there is no anxiety, no fear of authority - we are all in this together, kids and adults, and we are welcome to test the robustness of our theories and predictions.
It is essential to introduce the idea of modeling scientific phenomena early - and it is never too early to start. In fact, you can start with toddlers. In many ways, toys are modeling the actual world for little kids - and you can discuss the limitations of those models with the little ones.
When I taught astronomy to 4th graders, I would start my first class with a question - is Moon made out of cheese? Of course, the students laugh (what a weird teacher!). But when pressed, they need to give me a reason why it is NOT made of cheese.
Of course, this is a joke, but it is not such an easy question. How does science know about the objects we cannot touch and explore directly?
All students would come up with direct explanations (i.e. the pictures do not show cheese on the surface of the Moon - so I counteract, that the cheese may be inside the planet, under the rocks; or, a more creative one - the spaceship has not melted any cheese while they were landing - but one can find a counterargument for that as well). It takes them a long time to think of where the cheese comes from and how big should be those space cows to make enough milk to make cheese for a whole Moon (and again, here you can check their understanding of the size of the Moon)
Cognitive studies show a remarkable resilience of misconceptions - even when we know the scientific explanation of this or that phenomenon. One reason is that we tend to rely on our senses too much.
In my science classes, I love to start with a simple and visual demonstration of how our eyes and brain can deceive us - optical illusions.
If you plan to talk about physical phenomena with your children, start with vision and optics. This is the most "obvious" thing you can do - talk about what you see and why you see it this particular way. For example, why does your brain locks on one image and ignores other interpretations?

Kids love comparing their interpretations of optical illusions, and they are fascinated when they learn that other animals see colors differently. For example, what color is this flower? - well, it depends on whether you ask your friend or a bee.
From this discussion, one can easily infer why we cannot rely on our senses and why science needs some objective measuring devices. But another critical conclusion is that our brain is a predictive mechanism - more in the realm of " believing is seeing" rather than " seeing is believing" - and big and small theories we create should be questioned carefully.
I love to keep some optical illusions on the walls as a silent reminder to children to question the first thought that comes into their mind - and look for another perspective.
Before you even start talking science with your children, take a pen and a piece of paper, and write down a few quick notes for yourself:
What are your expectations of your student's understanding of the subject? Where do your expectations come from?
Could you check it out? What misconceptions do they actually have? What drives their misconceptions? Are they deeply ingrained, or are they easy to change? Be a scientist studying your student/child.
Most of the time, you can see where they come from. Let children talk, and encourage them to share different views and opinions. Try to find something legitimate and valuable in each case; show students how those things can relate to and enhance each other. Look for the seed of truth, or acknowledge the reason why they think so - while showing them how their ideas may be validated or disproved.
Creating imaginary worlds is a great way to test for misconceptions while removing the fear of a wrong answer.
There are many ways to uncover the misconceptions, such as asking, "Why are you thinking so?" or taking the situation to its absurd. The latter method is the best to keep a child's interest and help them develop their critical skills.
Talking with children about our learning through misconceptions on a regular basis helps the child to avoid learning anxiety, helps to develop a growth mindset, and to become a scientist of their own cognitive process.
It is extremely important for children to realize that it takes time and effort to understand something well enough - and that even the best minds make mistakes, many and often. Therefore, a great activity for a middle or high school student (that may be a good work worth publishing in a student magazine or science fair) is researching and analyzing some misconceptions made by the best scientists of the former centuries.
Here are some suggestions:
What made Aristotle think that force is proportional to velocity rather than acceleration?
What made people think that flies are born out of spoiled meat?
Why people of the Middle Ages thought that heat and cold were substances rather than processes (and two different ones, at that)?
Why did ancient Greeks think we see due to the invisible tentacles emanating from our eyes?
What made Descartes think that Earth is hollow inside?
What made people think that water exists only on Earth?
A saying goes, " Let's make better mistakes tomorrow." Teaching your child about "intuitive theories," "the feeling of knowing," and the mistakes made by great minds helps them to develop a growth mindset and stay resilient in the face of failure.
Science is driven by paradoxes that arise out of misconceptions. And that is a great gift brought to us by our misunderstanding.

In 1900, Lord Kelvin said, "There is nothing new to be discovered in physics now. All that remains is more and more precise measurement." There were only a few marginal glitches on the edges - something that did not fit quite well into the beautiful building of physics, something that was slightly bothering - something that eventually gave birth to relativity and quantum mechanics.
And real science is meant to be playful. A scientific mind is a playful mind. Many first-class scientists were also first-class pranksters (think Wood, Gamow, Feynman – and even Einstein, who valued imagination above all). Scientific thinking cannot be taught in a rigid way. And if we remember that our brain tends to play games with us, deceive us in unexpected ways, ignore evidence that does not fit into our picture of the world, twist our memory, and jump to conclusions, it makes the whole scientific endeavor ever more exciting.
How often do you model making mistakes in front of your children? What is your ideal way of making mistakes? How do you recognize them? Do you appreciate your mistakes? How do you feel about making mistakes? Do you welcome mistakes as your teachers? Do you treat them well? Do you collect them? Do you sort them? Do you review them from time to time?
Let me invite you to play a game of mistakes with your child. Come up with a topic unknown to both of you - and explore it together. Have fun, model making mistakes with your child, and teach them how to make mistakes happily.
Designate a place for your mistakes. A text file, a photo album, a drawer filled with notes - your choice. Leave them there for a couple of months - and then come back to them. Has your understanding changed? What made you make that mistake in the first place? How did it feel to be wrong when you did not know you were wrong? Do you know more about yourself now?
One of the richest ways to make mistakes and explore your misconceptions is by creating an imaginary world. Here are some suggestions by an innovative Siberian educational company "Noogen" for older kids:
Imagine a world that has no holes. Explore the physical laws and life in this world.
Create mathematics of horror. What math operations do you have there? Explore their properties.
Create a world that has two axes of time, one perpendicular to another.
Explore your life on a cube planet. What would your maps look like? What about your physics laws?
Create a civilization without numbers.
Invent a school where people unlearn.
Enjoy!

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Eugenia Etkina

December 26, 2022 ·
Hi all, I finished sharing research related to the interpretation of student ideas and I hope that the term "misconception" will not appear in the discussions of this group anymore.

However, this does not mean that we are not aware or do not pay attention to student ideas. In fact, one of the main goals of the ISLE approach is to help students see how their ideas which they developed by living in this world and speaking the language are the ideas that physicists deepened, quantified, and applied. How do we do this? In other words, WHEN and HOW does the ISLE approach acknowledge and build on student ideas (let them be p-prims, resources or whatever you wish to focus on)?

I would like those who have been using the ISLE approach for a while to start the conversation. David Brookes, Yuhfen Lin, Yuehai Yang, Danielle Buggé, Bor Gregorčič, Dedra Demaree, Debbie Stephanie, Rob Charles, Diane Crenshaw Jammula, Sheehan H Ahmed, Allison Daubert and others! - please contribute, and then I will add my thoughts. Thank you!

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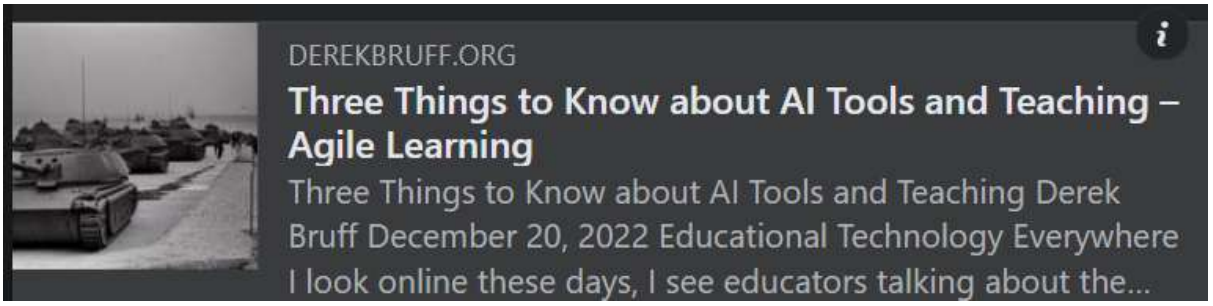
Allison Daubert
December 26, 2022 ·

Here's a thoughtful and short blog post on re-thinking teaching and learning in the age of AI bots. One of the strengths in ISLE are these non-traditional questions in the book as well as the focus on epistemic learning goals. We are pushing students to learn more transferable, meaningful goals and assessing them deeper than the standard back of the textbook problems. Personally, I'll be discussing using these AI bots next semester to help my students buy in to why we are doing more authentic and non-traditional problems.



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