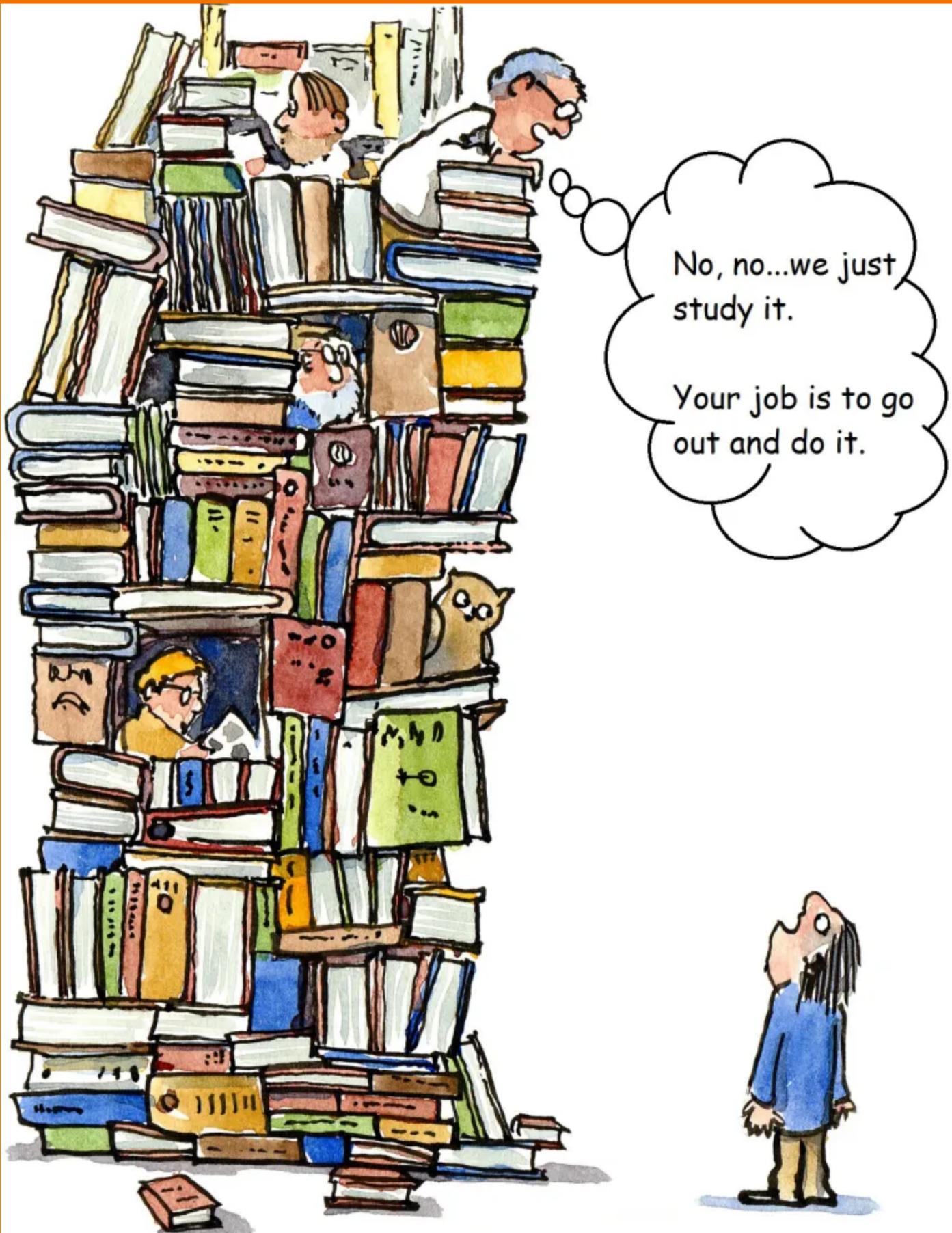


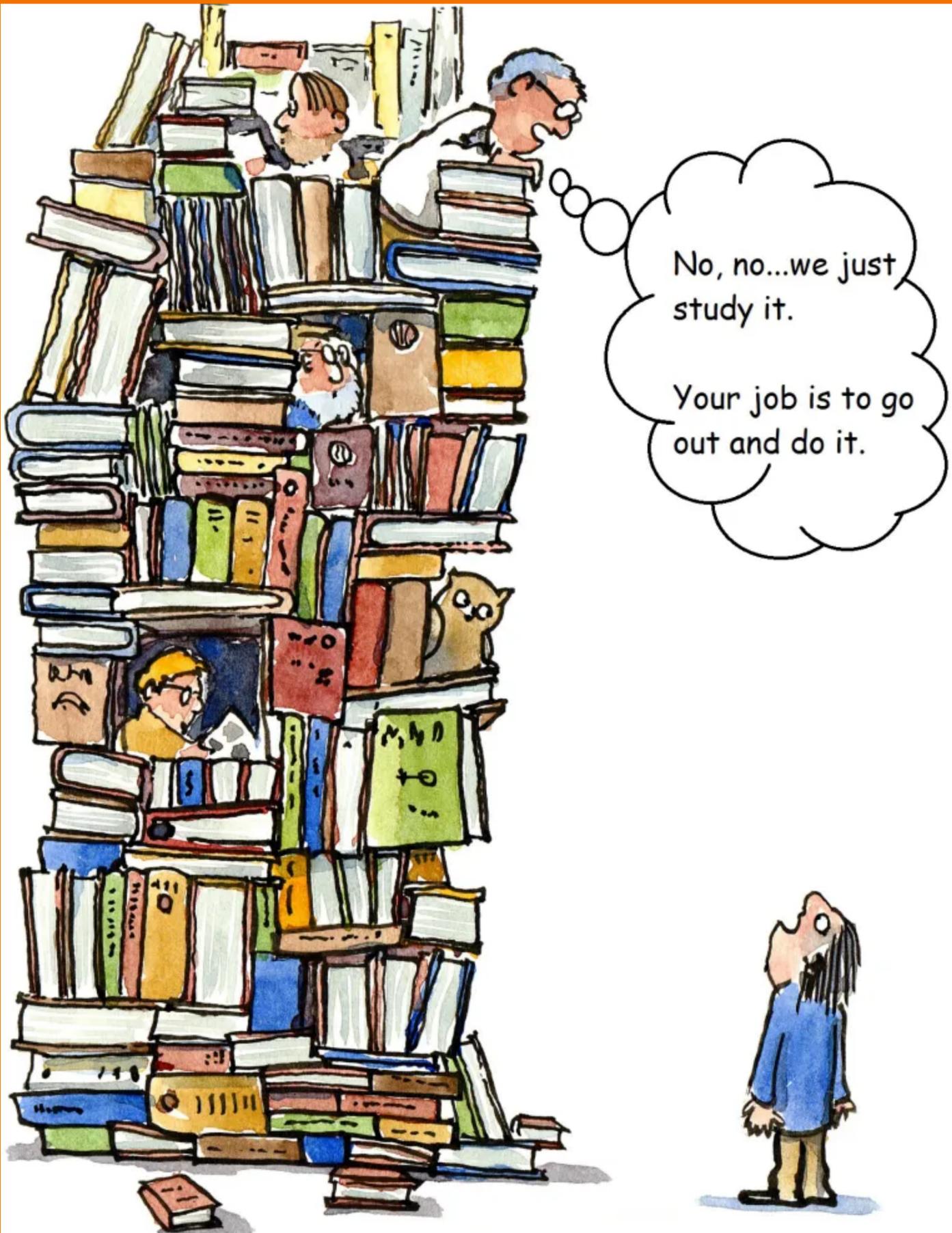
# Learning Physics through Communication: The Impact of Science Communication Assignments on Student Learning

Andrés Aragoneses (Whitman College, WA, USA)





- Write scientific papers
- Write technical reports
- Present posters at conferences
- Oral presentation at conferences
- Presentations at work meetings
- Sell company products
- Interviewed by media
- Talk to policy makers

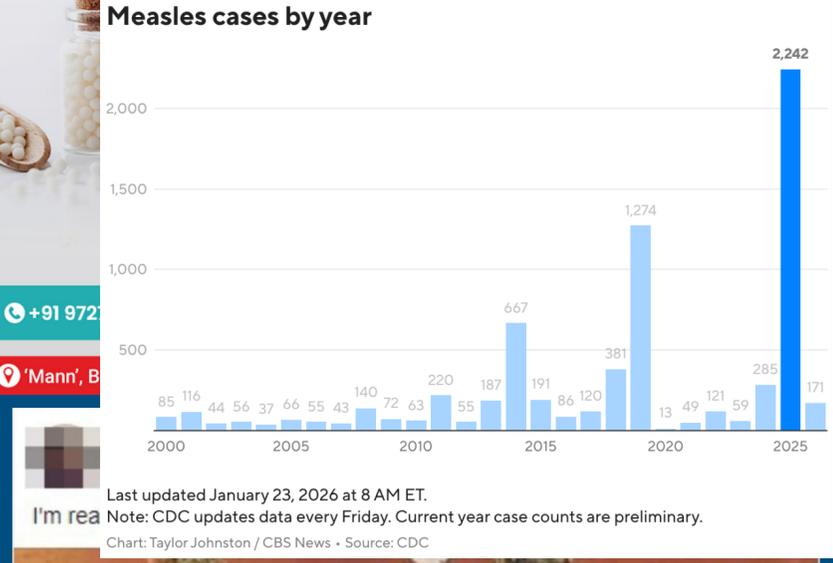
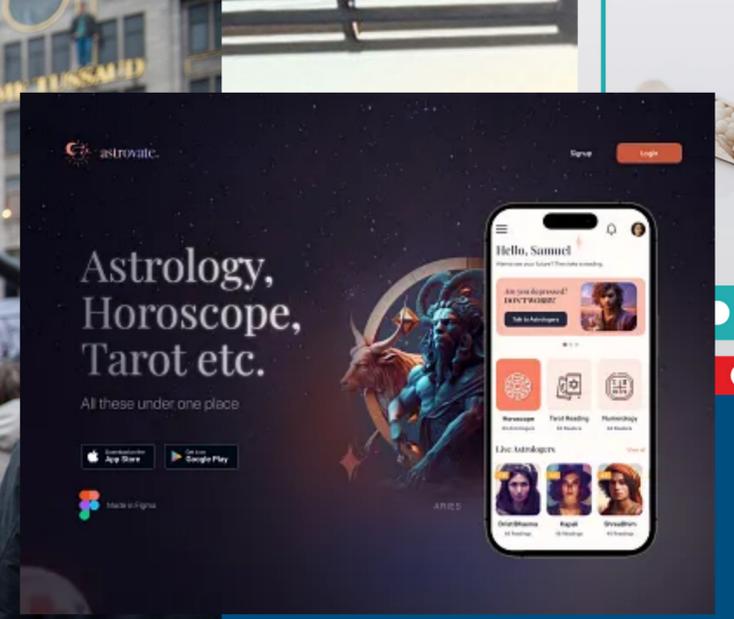


- Poster presentation
- Educational Youtube videos
- Teaching activity at high school
- Op-ed to local newspaper
- Policy advocacy presentation
- Stand-up presentation @ library



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**MANN HOMOEOPATHIC CLINIC**  
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**NEW**

**KINOKI**  
Cleansing Detox Foot Pads

Only by one night  
Black and oily toxins  
come out from the soles

Contains 10 Pads

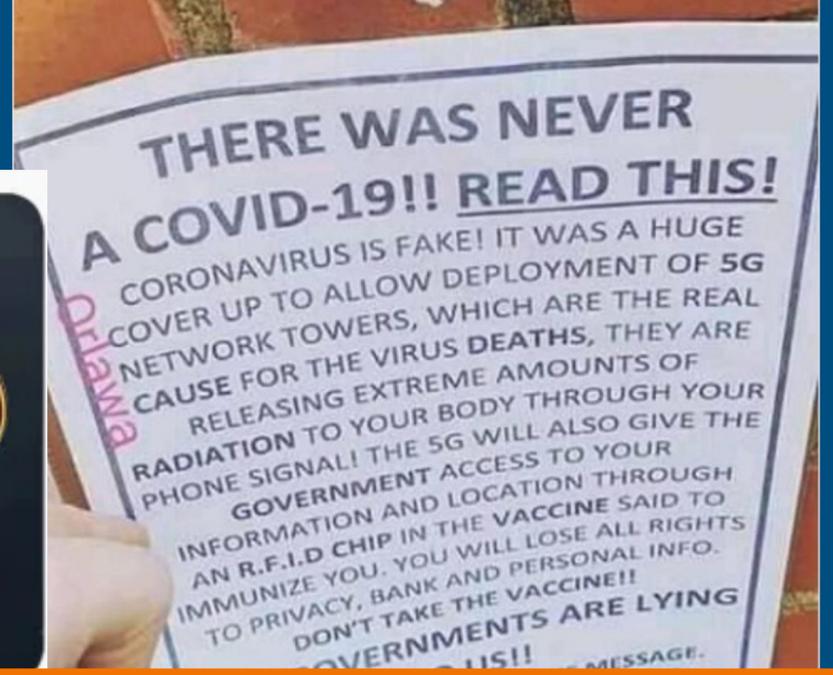
**7 piece**  
toxins dispelled

- Dispel toxins and maintain beauty
- Relax muscles & tendons and eliminate internal moisture
- Replenish vital essence and strengthening the kidney
- Shape and beautify body
- Promote sleeping and relieve fatigue
- Beautify foot and clear odour

Works While You Sleep!



**ANTI RADIATION**  
6 pcs



Poster presentation at an open outreach activity on relativity

## Disclosure day on relativity: A science activity beyond the classroom

Andres Aragonese\*, Department of Physics, Duke University, 27708, Durham, NC, USA.

M. Nuria Salan, Department of Industrial Engineering, Institution of Educational Sciences, Universitat Politecnica de Catalunya, 08034 Barcelona, Spain.

Antonio Hernandez-Fernandez, Department of Pedagogy, Institution of Educational Sciences, University of Jaen, 23071 Jaén, Spain.

www.relatividadespecial.com ALE: Relatividad Especial DFEN

### La paradoja de los gemelos

Joan Mas Colomer, Joan Pozo Prades, Marc Davas Codina

**Enunciado de la paradoja**

Dos gemelos deciden probar las leyes de la física Relativista y deciden que uno se vaya en una nave espacial a hacer un viaje a velocidades cercanas a la luz mientras que el otro permanece en reposo en la Tierra.

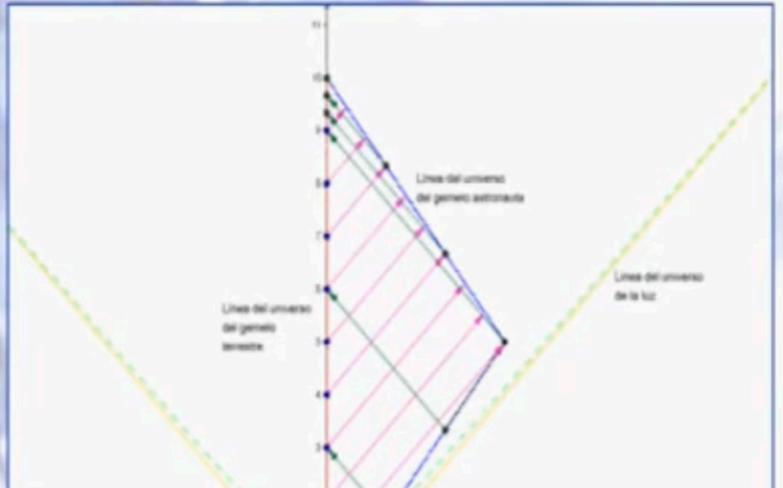
Al pasar cierto tiempo, el gemelo astronauta vuelve a la Tierra a visitar a su hermano.

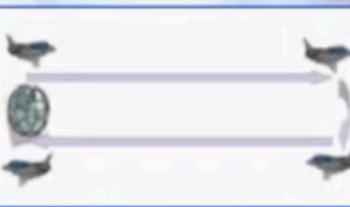
**Diagramas de MINKOWSKY**

El hecho de representar en un mismo gráfico el tiempo y las coordenadas espaciales conlleva que los problemas relativistas no sean más que problemas geométricos. Los diagramas que consideran el espacio y el tiempo en unos ejes matemáticos se les llama Diagramas de Minkowski.

**Resolución de la paradoja**

Dado que los sucesos que ocurren en el universo son percibidos por ambos gemelos en sus sistemas de referencia, usaremos el hecho de que los dos gemelos se felicitan mutuamente el cumpleaños enviando una señal para evidenciar la evolución temporal de cada gemelo.





La Teoría de la Relatividad dice que quien viaja a velocidades cercanas a la luz envejece más lentamente respecto otro que está en reposo; pero, desde el punto de vista del astronauta, el que realmente es más joven de los dos es su hermano terrenal y no él, cosa que desde el punto

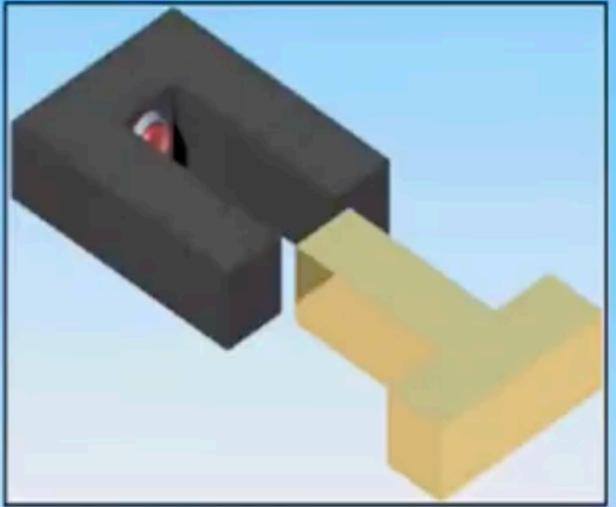
www.relatividadespecial.com ALE: Relatividad Especial DFEN

www.youtube.com - To exit full screen, press esc

### La paradoja de la llave y la cerradura

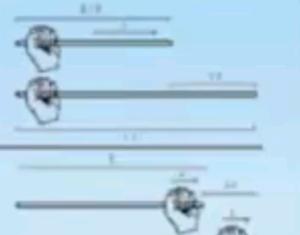
Rubén Méndez y Juan Luis Márquez

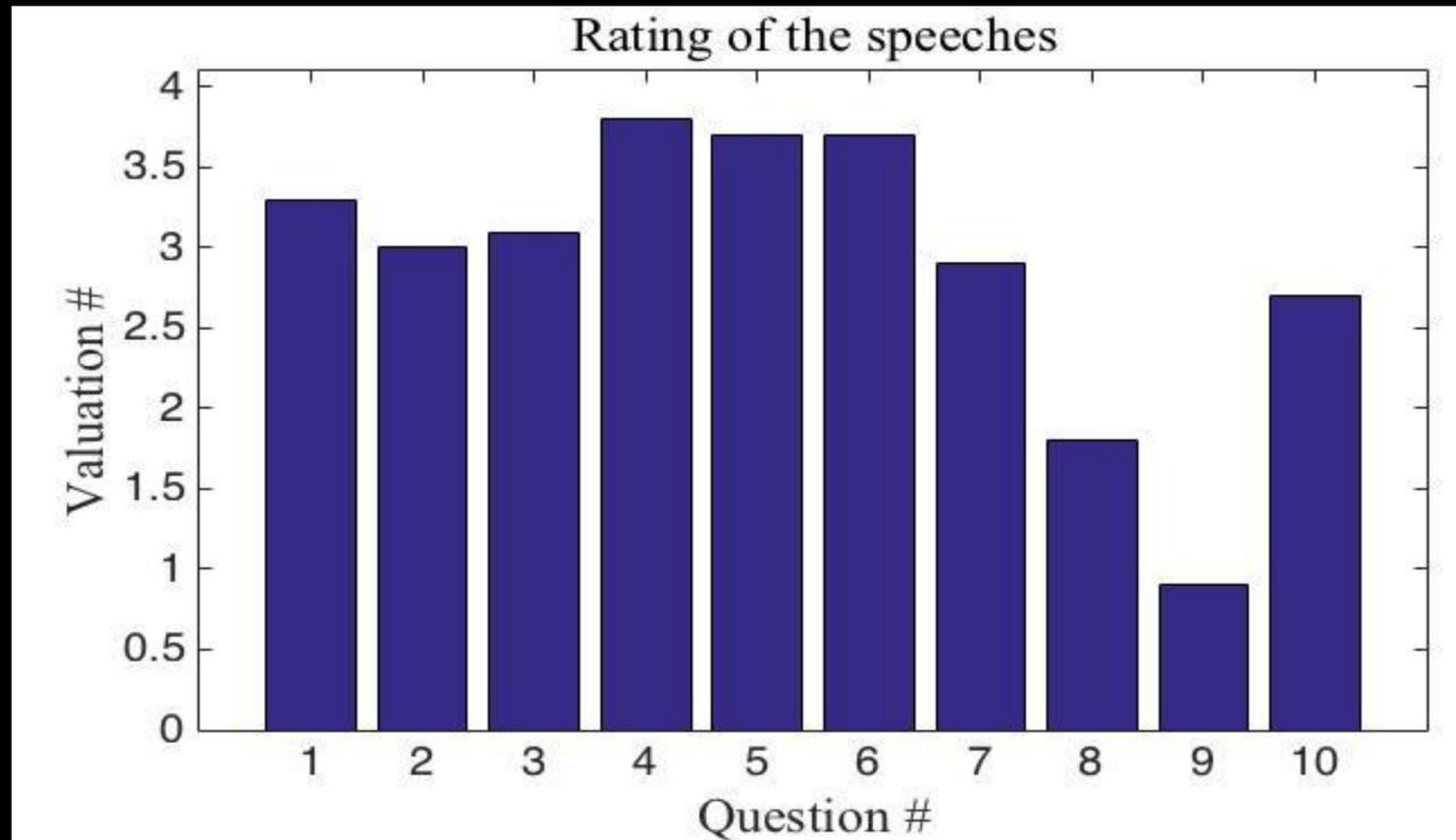
Considérese una llave de longitud  $l$  (con forma de T) y una cerradura (con forma de U) que, por seguridad, mide  $L > l$ . En el fondo de la cerradura hay un botón que acciona el cierre de una caja fuerte, que contiene la colección entera de tebeos de Super López. De esta manera, al ser la llave más corta que la cerradura, no se podrá abrir y estarán a buen recaudo. Para apoderarse de la valiosa colección un caco decide acercar la llave a velocidades relativistas (el caco ha estudiado relatividad en la UPC). Según el caco, la cerradura se acerca a él a altas velocidades, por lo que su profundidad sufre la contracción de Lorentz y así la llave podrá accionar el botón y abrir la caja. Pero desde el punto de vista de la cerradura, la llave mide menos y, si bien antes no podía accionar el botón, ahora menos. ¿Conseguirá este ex-alumno de la UPC hacerse con los tebeos?



Dependiendo de la zona por donde se agarra la llave para introducirla en la cerradura esta sufrirá una sobrecontracción o sobreexpansión como se observa en cada figura.

En el espacio tetradimensional de Minkowski podemos observar como para 3 longitudes de llave introducidas a la misma velocidad relativista, la de longitud de  $K_1$  no llega nunca a pulsar el botón del fondo de la cerradura.



5.- I am interested in enlarging my scientific culture.

6.- I have found it relevant for my preparation having a broad scientific culture.

8.- I think I am aware of the latest developments in science and technology.

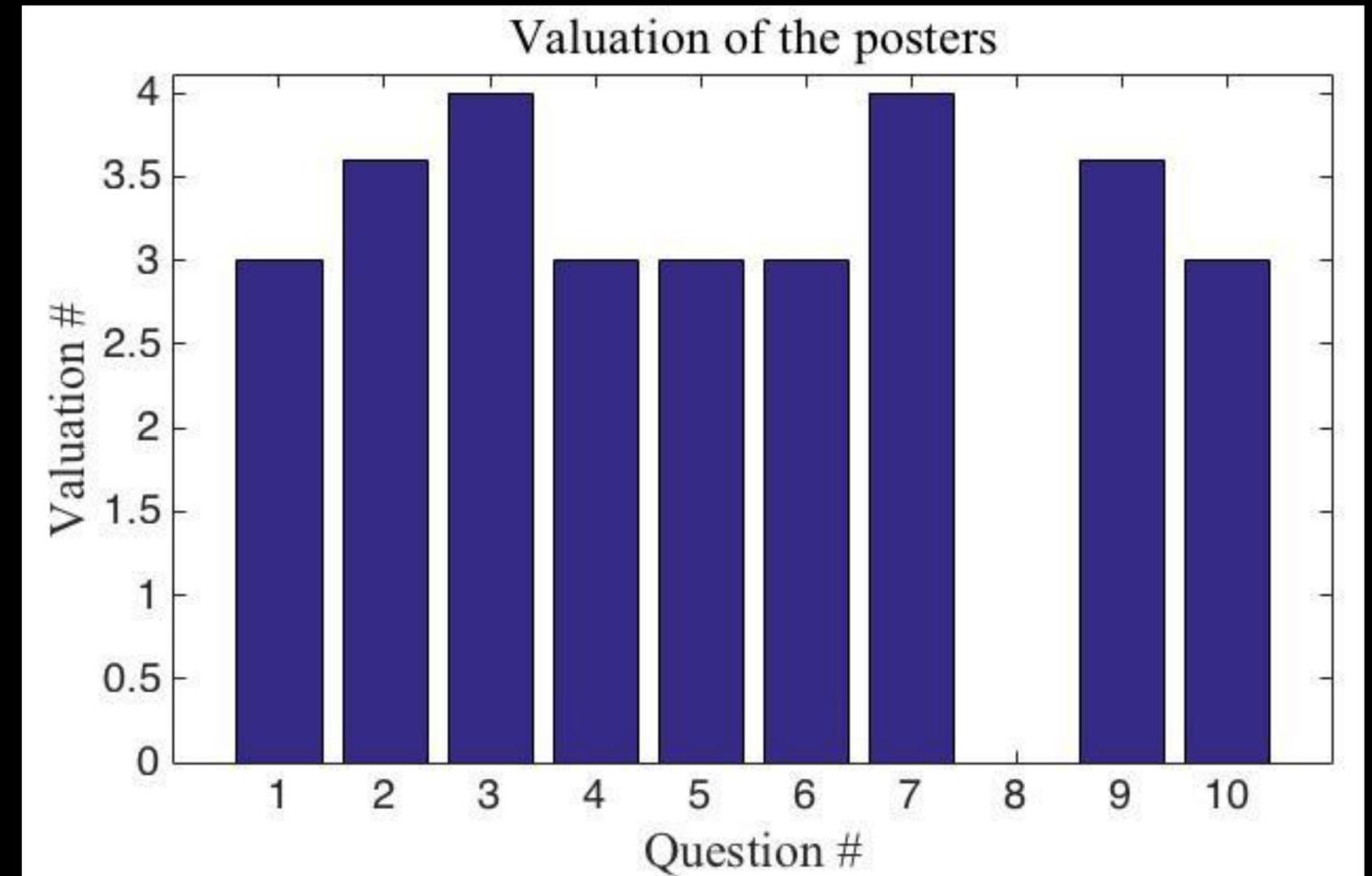
9.- I would rather prefer to have devoted more hours to lectures and problem solving than to talks.

2.- Communication items (typography, color, functionality, ...). Is the poster easily read? Do figures and plots help its understanding?

3.- Presentation of the contents. Does the poster reflect the work? Is it self-contained?

8.- Group work. All the members have taken part actively in the presentation and the question.

9.- Questions/Answers. The answers to the questions have been clarifying and efficient.



## Creation of an educational Youtube video

# Grading guide

## 1. Duration (5pts)

- 3-5 minutes

## 2. Video content (20pts)

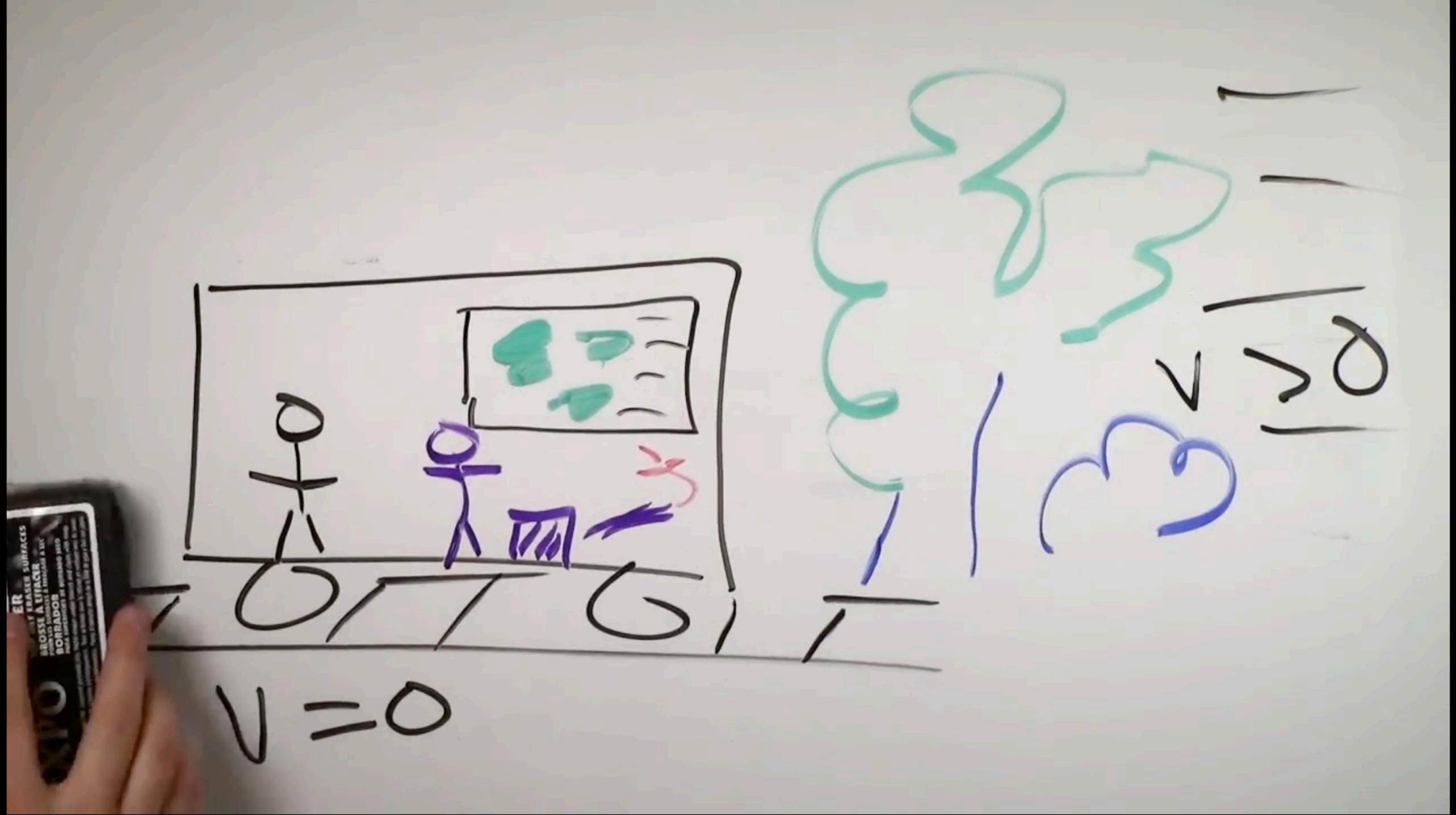
- Self-introduction. 1-2 sentences [10-15 secs.]
- Provide general preview of the topic/desired learning outcome [15-20 secs.]
- Deliver your lesson [2-4min.]
- Review/summarize your lesson. Provide direction for student application of lesson.

## 3. Pre and post-production (20pts)

- Script.
- Framing, color & luminosity.
- Vocal delivery & audio levels.
- Titles.

## 4. Physics (55pts)

- The statement of the problem to solve and the concept to explain is clear.
- The images used help understand the physics.
- The equations used are the correct ones.
- The graphs/plots are meaningful, complete and labeled.
- Numbers are correct and with proper units.
- The equations used are well explained.
- The numerical problem is clearly explained.
- The solution to the numerical problem is correct.
- The explanation of the concept is clear and rigorous.
- The explanation is self-sustained. The audience does not need additional knowledge to follow the video.
- The explanation is addressed to the target audience.



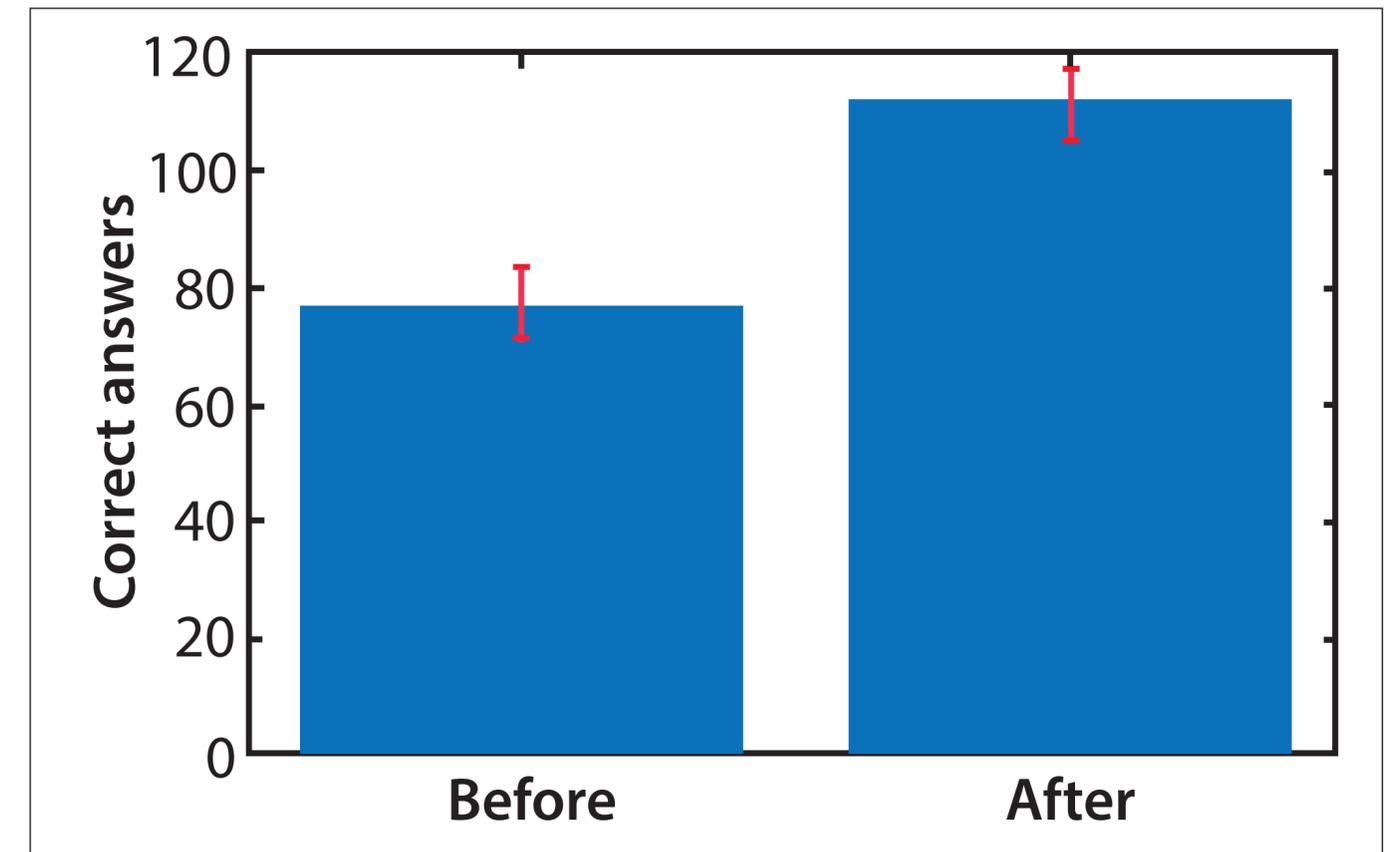
ER  
 ERASE SURFACES  
 BROSSE À EFFRAYER  
 BORRADOR  
 WIPER

# Developing Educational YouTube Videos as a Tool to Learn and Teach Physics

*Andrés Aragoneses*, Eastern Washington University, Cheney, WA, and Carleton College, Northfield, MN

*Rebecca Messer*, Northfield High School, Northfield, MN

	Before		After	
	True	False	True	False
In parabolic motion, if you double the initial velocity, would the object reach twice as far?				
An object following parabolic motion on the Moon would reach six times further than on Earth (gravity on Earth is six times that on the Moon).				
If we drop a bottle filled with water and the same bottle filled with iron marbles from a certain height, both would fall at the same rate.				



## Writing an op-ed to a local newspaper



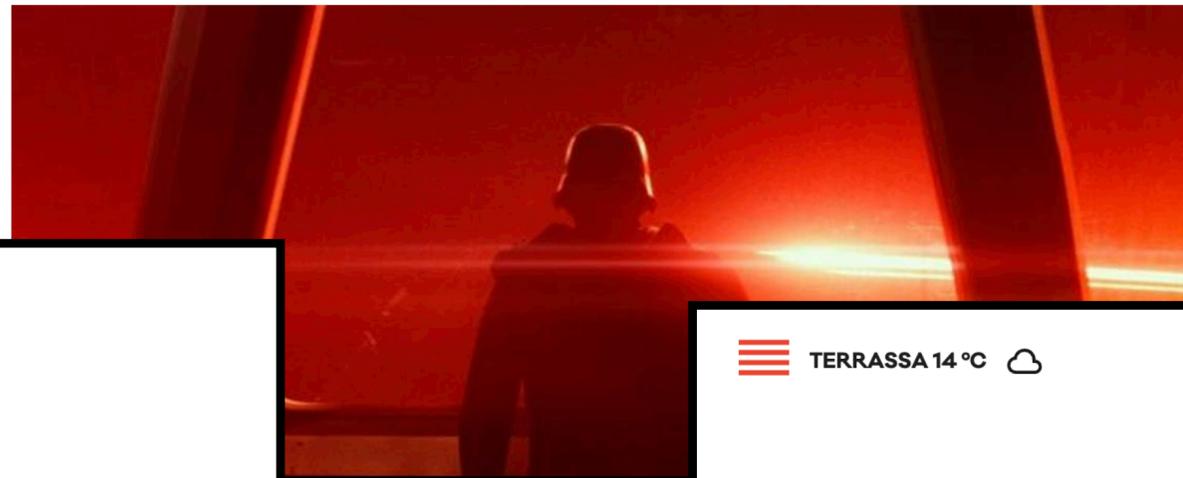
Opinion articles provide independent perspectives on key community issues, separate from our newsroom reporting.

OP-ED

## Be aware: The dark side governs the galaxy

By **Andres Aragonese**

Updated December 19, 2015 9:11 PM



# SPACE DAILY

your portal to space

SPACE TRAVEL

## The Study of Science through Popular Movies

by Staff Writers  
Durham NC (SPX) Oct 23, 2015

Who says class has to be all about lectures and labs? Andres Aragonese, a quantum optics researcher at Duke, has created a class called "Science and Science Fiction" in conjunction with the Osher Lifelong Learning Institute at Duke (OLLI). The course explores hot science fiction topics through the study of famous movies - from Star Wars, to Independence Day, to The Martian.

The unconventional idea to use movies as the primary medium for the class was born during Professor Aragonese's time teaching in Spain. Physics professors at his university had found that in order to get students to follow their classes, they had to do more than just explain Newton's law and demonstrate practice problems. So, they began to relate these complex topics to media that the students were familiar with - news, cinema, and comics.

Each week, the OLLI group watches small scenes of movies that use scientific concepts in their production, and then learns the true theories behind these concepts. Most movies are quite fantastic when it comes to their scientific aspects, and this leads to incorrect representations of cosmological, physical, and astronomical phenomena on the screen. Focusing on a single concept each class, Aragonese debunks Hollywood myths about natural disasters, comets, solar flares, neutrinos, and magnetic fields (to name a few).



Astronauts traveling with jet packs in "Mission to Mars". For a larger version of this image please go [here](#).

OPINIÓ

## La Tierra vuelve a temblar



Andrés Aragonese

08 de juny de 2017



Literalmente, la Tierra ha vuelto a temblar. No me refiero de algo metafórico en referencia a las bárbaras decisiones de algunos líderes mundiales, que no ven tres en un burro, y que afectan a todo el planeta. En concreto, el miércoles 4 de enero todo el planeta Tierra, y todo en él,

Presenting a stand-up speech at the public library

**5 minute  
explanations**

**GPS, lasers, &  
more**



**no science  
background  
needed**

**elevator pitches**



**Wednesday, April 1st @ 2:00 pm and Thursday April 2nd @ 10:15 am**



# Thank you for your attention

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