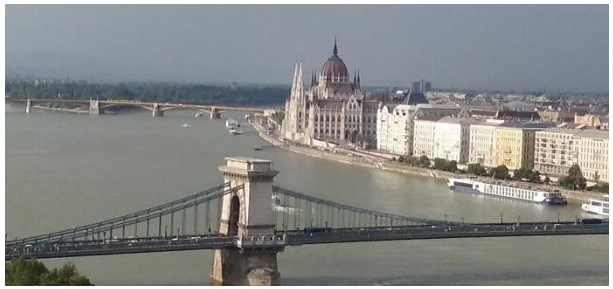
PHYSICS TEACHING ACTIVITIES AND RESOURCES

BEATA JAROSIEVITZ DR. PHD.

COLLEGE PROFESSOR

DENNIS GABOR COLLEGE



Institute of Basic and Technical Sciences, Budapest, Hungary

E-mail: jarosievitz@gdf.hu

Budapest, 28.03.2017.

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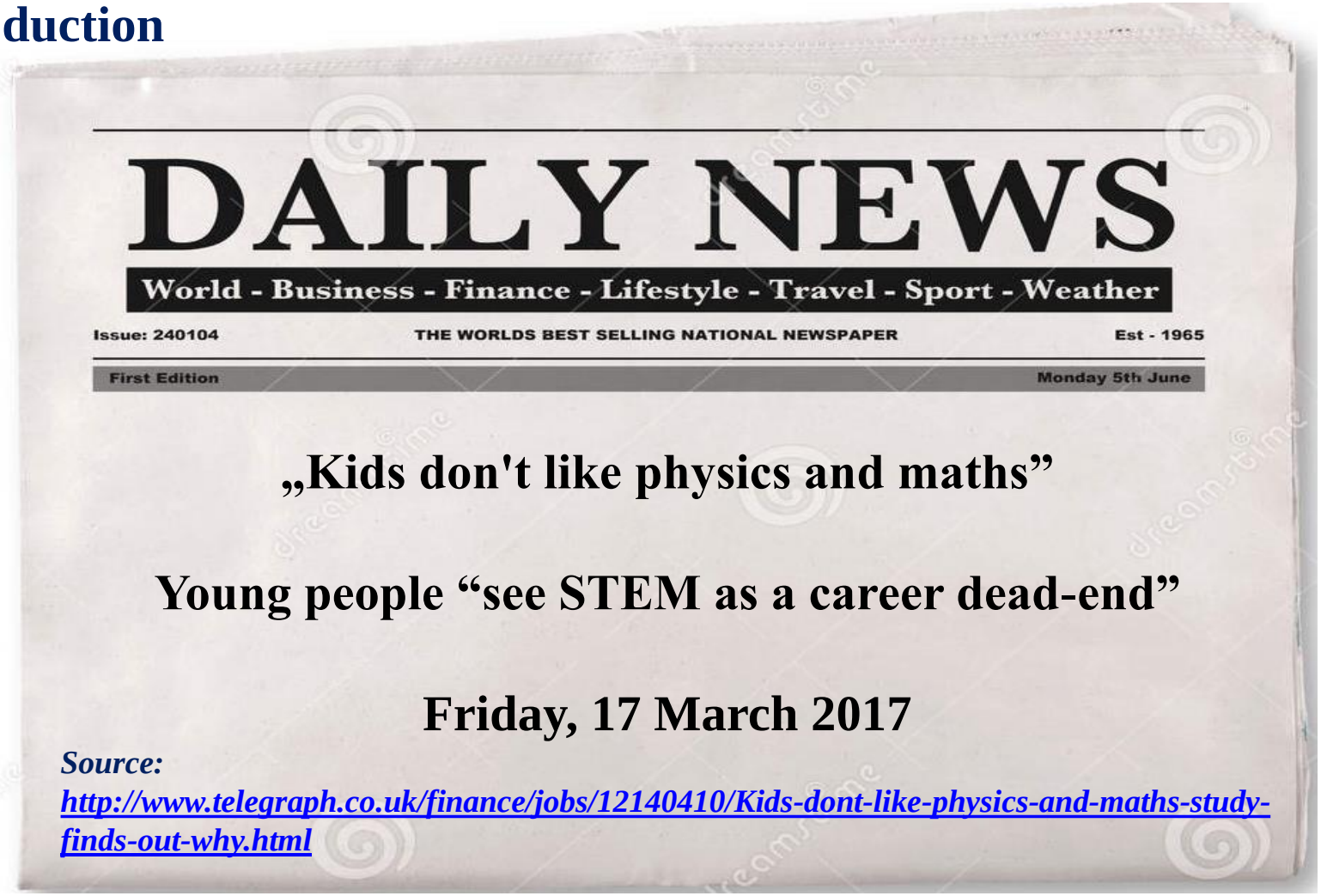

DAILY NEWS

World - Business - Finance - Lifestyle - Travel - Sport - Weather

Issue: 240104 THE WORLDS BEST SELLING NATIONAL NEWSPAPER Est - 1965

First Edition Monday 5th June

„Kids don't like physics and maths”

Young people “see STEM as a career dead-end”

Friday, 17 March 2017

Source:
http://www.telegraph.co.uk/finance/jobs/12140410/Kids-dont-like-physics-and-maths-study-finds-out-why.html

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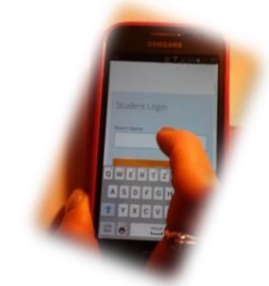
PHYSICS TEACHING ACTIVITIES AND RESOURCES

1. Introduction

- the popularity of "physics" has decreased worldwide *(OECD, 2000, 2001, 2005)*

Newton's cradle

- the **traditional physics** classes **are not** good enough for **attracting the students**' focus to the lectures



- students have at least one of the digital devices (tablet, smart phone), but do not use them for study

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1. Introduction

Action plan

- we should act immediately to change students' attitude *(Richard, 2016)*
- **physics** classes should be made more

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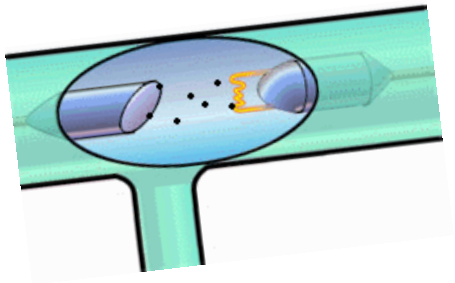
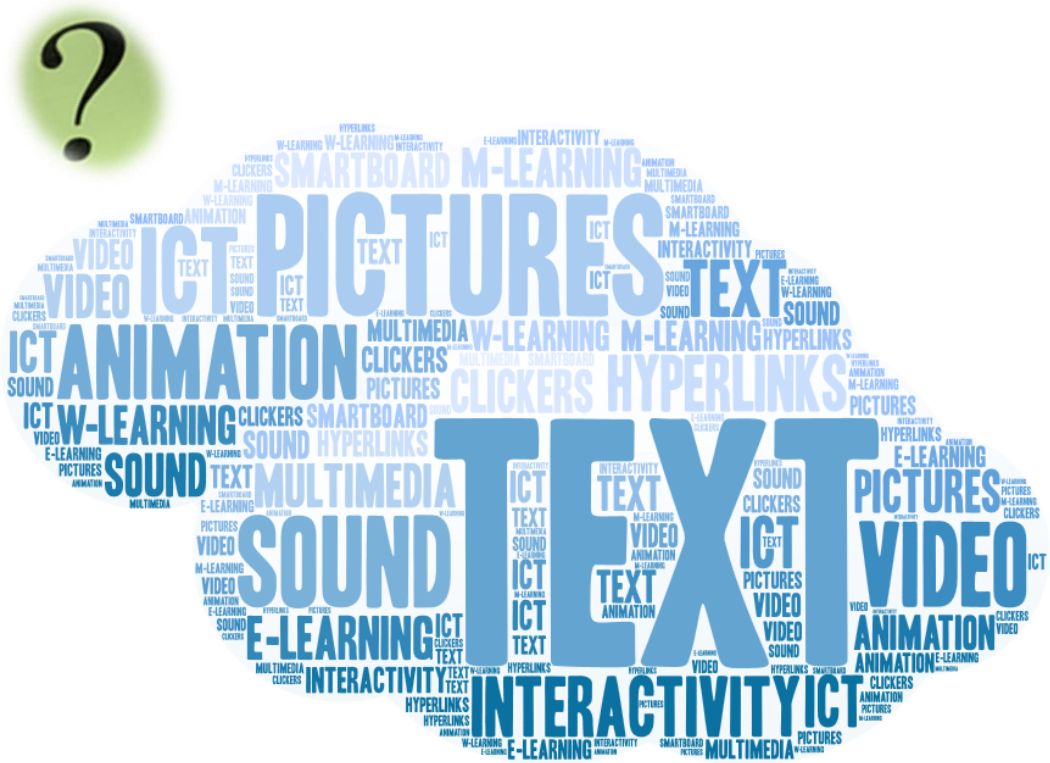
2. Questions

What can we do





- we should use: **m-learning devices (BYOD),** multimedia and its applications, video files and simulation programs *(Jarosievitz, 2016, 2017)*

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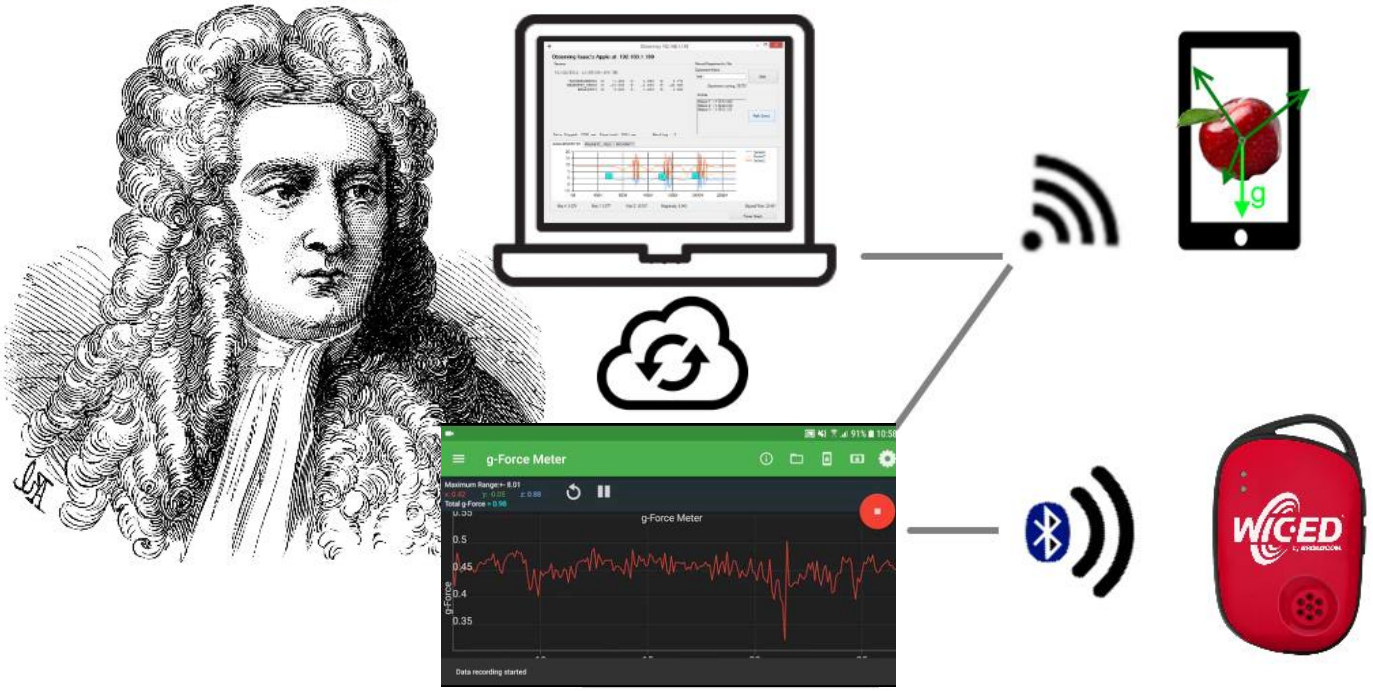
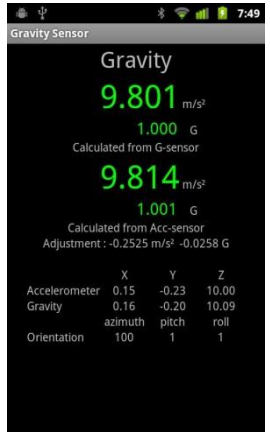
2. Questions

What can we do

Sir Isaac's Apple





Source: http://isaacsapple.littlebytesofpi.com/

- **use other interactive teaching activities and resources**

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3. Hypothesis

- **interactive activities**, resources **will improve students' core competencies**,
- colourful classes **rise up the lectures attendances**,
- **using mobile devices make** the physics education **more effective**,
- students will **become more motivated.**

Made by: https://tagul.com/cloud/2

PHYSICS TEACHING ACTIVITIES AND RESOURCES

4. Participants

Students of:

- ❖ BSc in Computer (IT) Engineering
- ❖ BA in Business Administration and Management

} from Dennis Gabor College, whose study includes courses like: **Physics**

In the **first year** of BSc studies **all students study the same modules.**

Credits: **5** (first year, II. semester) Written exam

Full training education (FT) L (lecture): 30 hours, S (seminar): 15 hours

Distance training education (DT): L (lecture): 6 hours, S (seminar): 3 hours

Course description: Mechanics; Thermodynamics; Optics; Nuclear Physics

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5. Methods

Lecture Method

- used for example for describing the structure of atoms

  (the concept of **A** and **Z)**

Cooperative method (Jigsaw)

- used for group-work activity, assessment based on gamification
- collaborative learning

Inquiry-based learning

Hypothesis → Observation → Analyzing → Interpreting → Conclusion

Flipped classroom

(Jarosievitz, 2017)

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5. Methods

Traditional Flipped Model

Original Bloom's Taxonomy (1956)

Traditional Flipped Model

21st Century Bloom's Taxonomy

adapted from Anderson & Krathwohl (2001)

Source:

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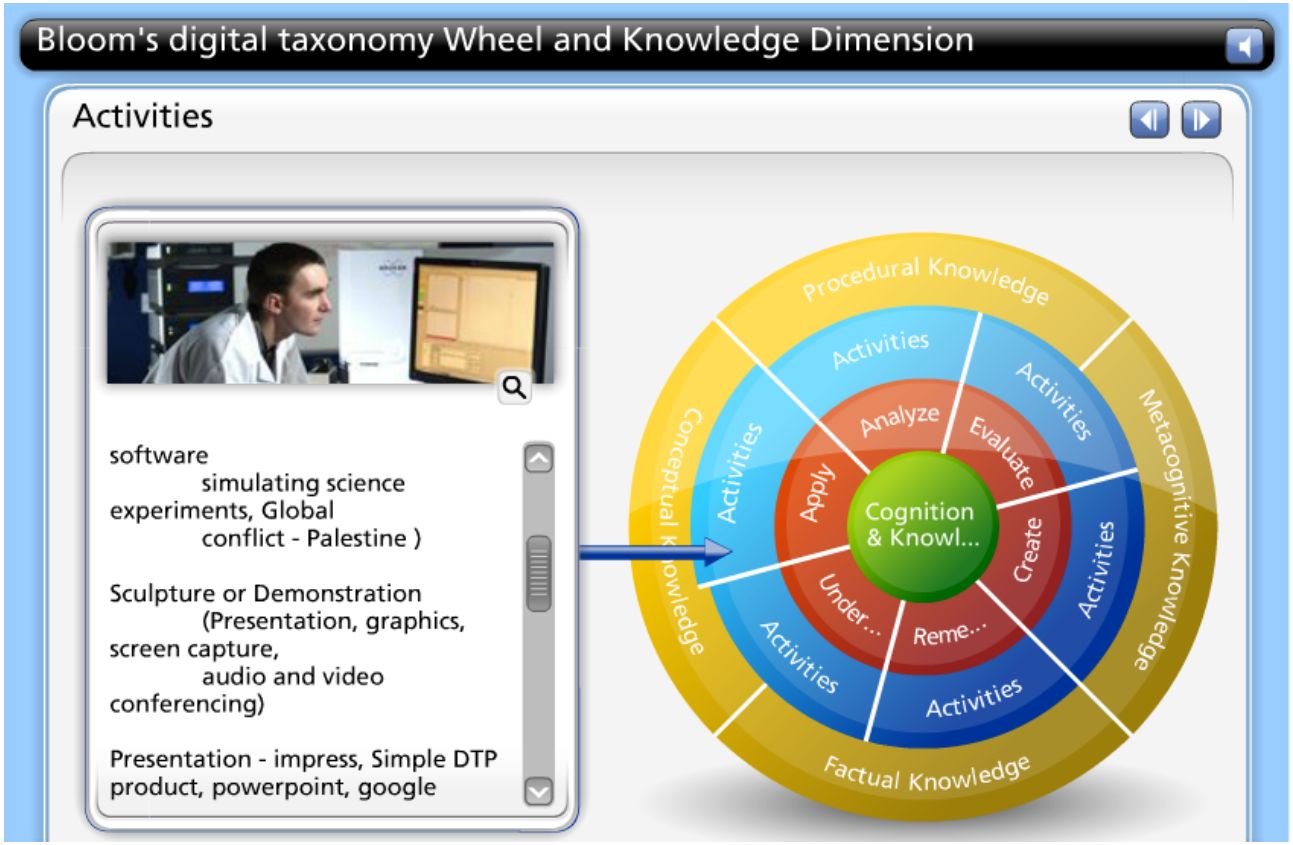
5. Methods

Bloom's digital Taxonomy wheel and knowledge dimension



Source: http://eductechalogy.org/swfapp/blooms/wheel/engage.swf

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5. Methods

- Bloom's Taxonomy is easy to integrate to a digital learning environment
- 21st century learning skills: 4 C's

Source

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6. Activities

Types of activities

- Educational games
  - http://www.cernland.net/
- Brain stormings
  - http://padlet.com
- Simulations
  - http://www.sukjaro.eu/cikkek/cikkek.htm
- Hands-on experiments
  - http://www.sukjaro.eu/JBea/pdf/spice_oktatas.pdf
- Remote measurements
  - http://go-lab.gw.utwente.nl/experiments
- Recorded experiments
  - http://www.sukjaro.eu/JBea/pdf/jarosievitzbeata2016Girep.pdf
- Quiz questions for assessment
  - socrative by MasteryConnect
- ICT based activities
  - http://learningapps.org/
- E-Learning courses
  - The exponential decay law
  - Radioactivity
  - Radioactive chains
- Flashcards
  - https://quizlet.com/

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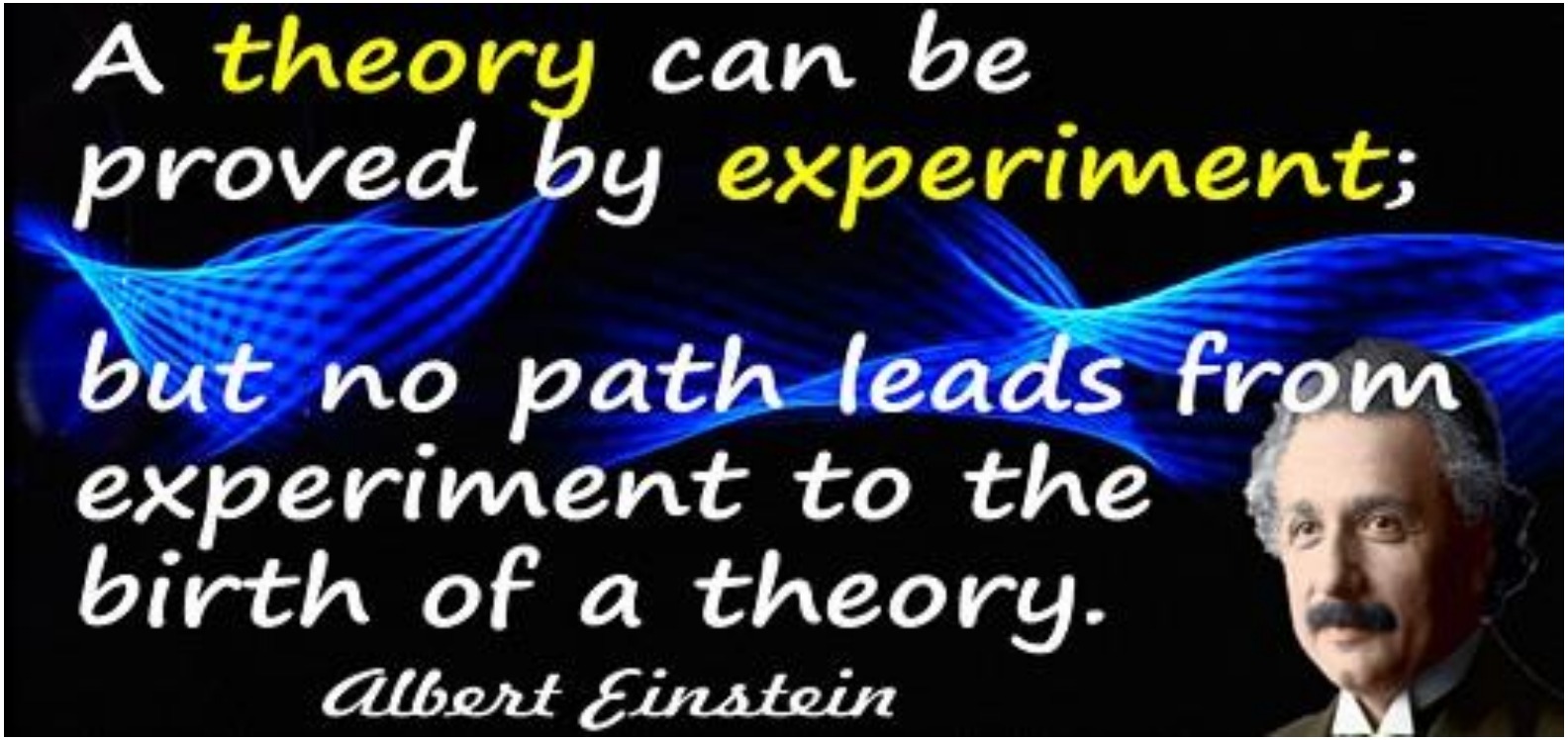
6. Activities

Hands-on experiments



Source

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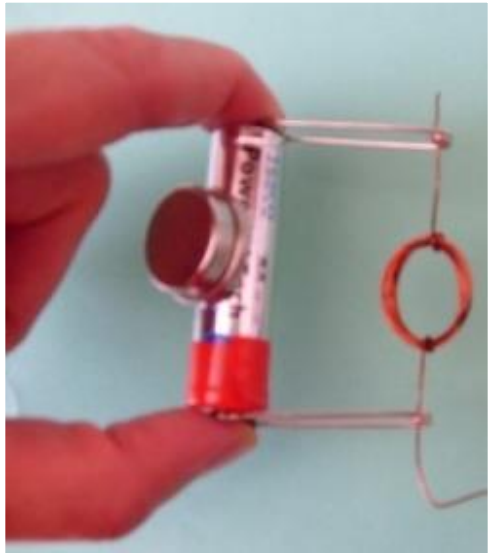
6. Activities

Hands-on experiments

Newtons' law



Electric motors

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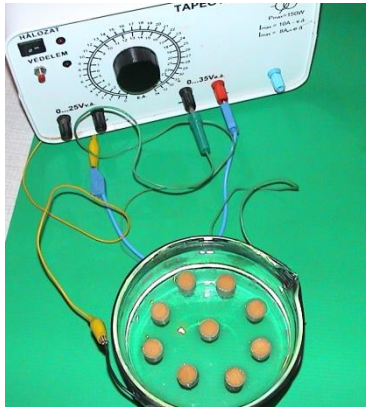
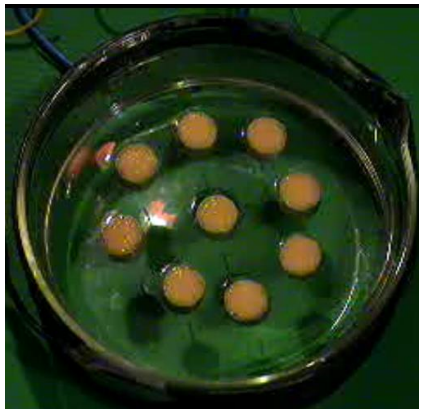
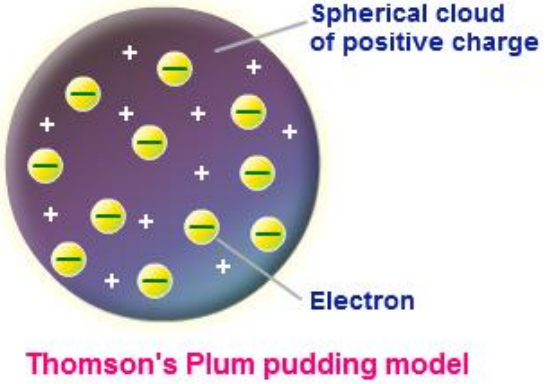
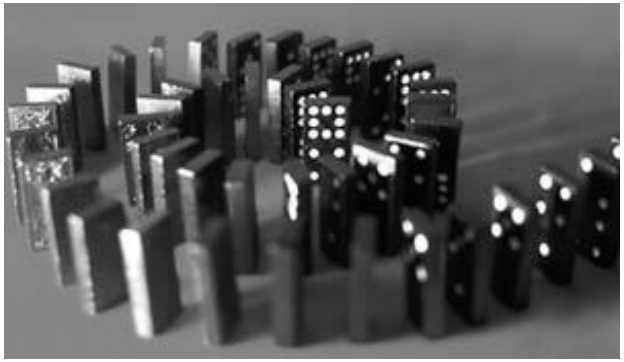
6. Activities

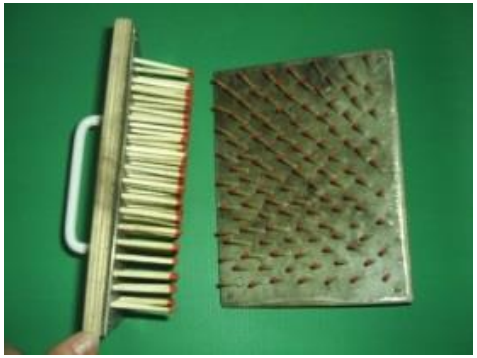
Recorded experiments











Chain reaction

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6. Activities

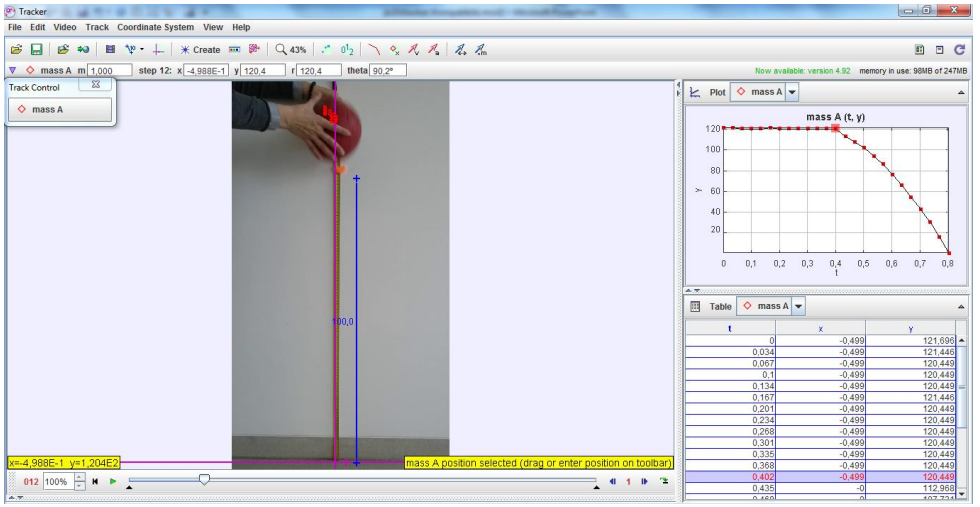
Recorded experiments

Measurements (BYOD)

Necessary materials :

- Handball (any large, highly visible balls)
- ruler
- smart phone or tablet
- laptop
- free program Tracker Video Analysis and Modeling Tool

(http://physlets.org/tracker)



Source: http://moodle.scientix.eu/course/view.php?id=179 Author: Carlos Cunha

6. Activities

Recorded experiments

$$y = a \cdot x^2 + b \cdot x + c$$

Processing of the measurement results:

$$a = \frac{g}{2} \Rightarrow g = 2 \cdot a \qquad y = \frac{g}{2} \cdot t^2 + v_0 \cdot t + y_0$$

Felvett videófájl neve	a	g (m/s^2)	$x_{á} = \frac{\sum x_n}{n}$	$(\Delta x)^2$	δx
20160311_123159.mp3	4,630	9,260	9,33	0,07466619	1%
20160311_123217.mp3	4,620	9,240			
20160311_123235.mp4	4,720	9,440			
20160311_123253.mp4	4,670	9,340			
20160311_123316.mp4	4,691	9,382			
Átlag		9,33			

$$x_{á} = \frac{\sum x_n}{n} \qquad (\Delta x)^2 = \frac{1}{n-1} \sum_{i=1}^{n} (x - x_{á})^2 \qquad \delta x = \left(\frac{\Delta x}{x_{á}} \right) \cdot 100$$

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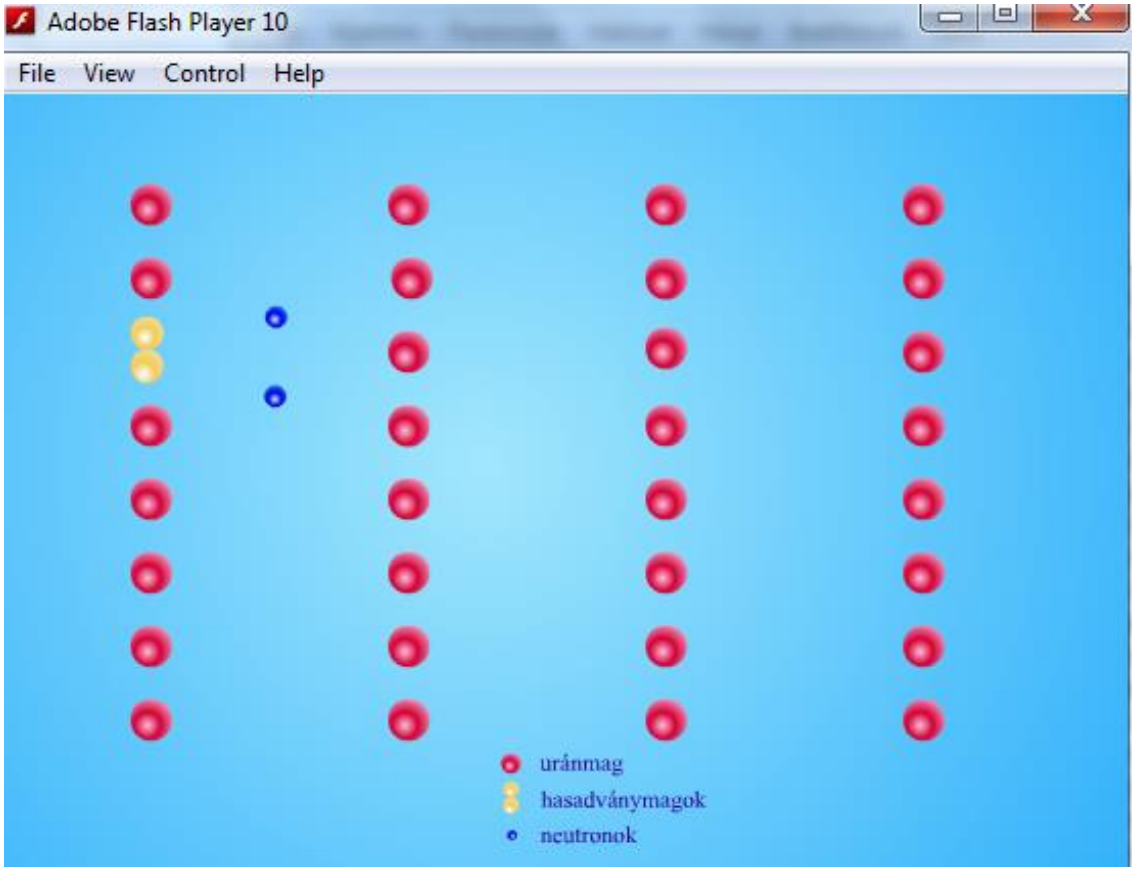
6. Activities

Simulations

Nucleus

Fission fragments

Neutrons



Simulated chain reaction (*See more*)

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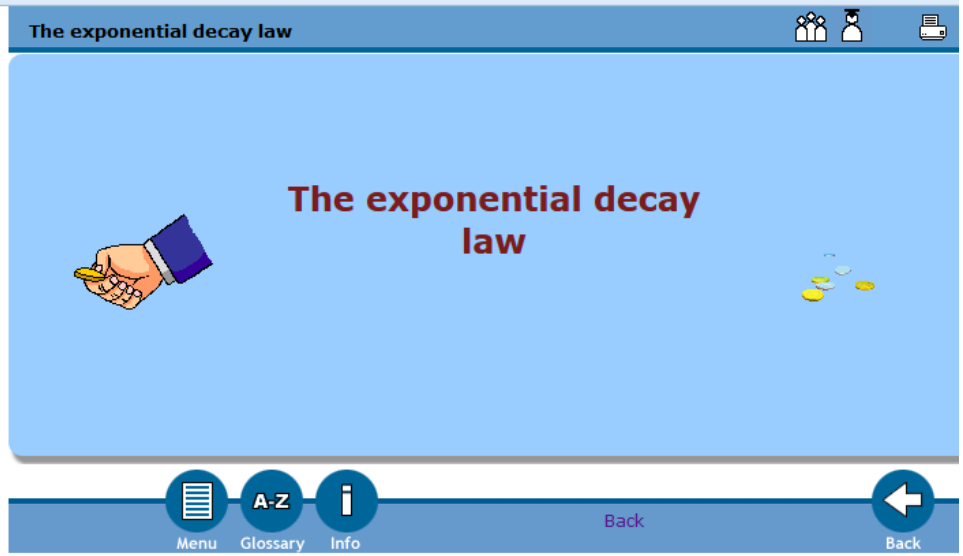
6. Activities

E-Learning courses

Resources - online courses

http://www.sukjaro.eu/cikkek/exp_engl/home/index.htm

- The exponential decay law
- Radioactivity
- Radioactive chains



eLearning FÓRUM MINŐSÉGI DÍJ | 2016

Aim:

to teach some of the fundamental properties of the radioactivity:

- the random behaviour,
- the exponential decay law,
- notions of half-life,
- decay constant and activity.

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6. Activities

ICT based activities

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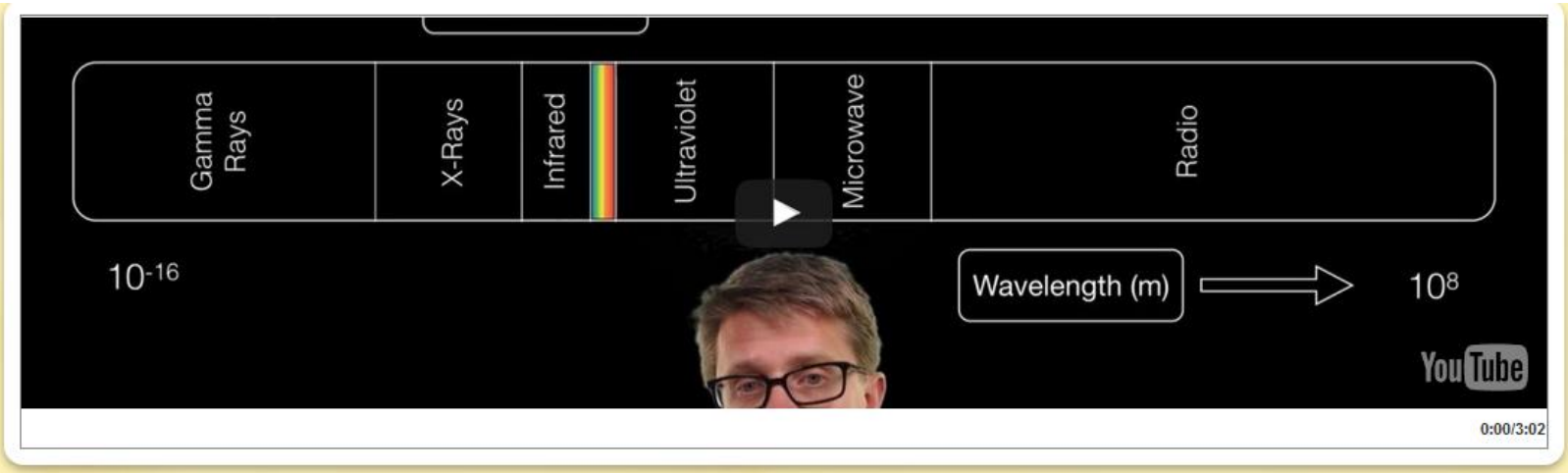

Newton had shown that if you shine _____ light ito a prism it breaks it apart into its different _____. William Herschel found out that each color has a different _____ and that the _____ temperature is the one measured with the _____ on the side of the red light. He discovered _____ rays. If we put electromagnetic radiation on a _____, we can go from low to high frequencies and at the same time from high to low _____. As we increase _____ we also increase the amount of _____ that the waves have. So which one would you rather be exposed to? The ones with high _____, really really low _____ and low _____. High energy waves can _____ cells or even cause damage to the _____ temselves.

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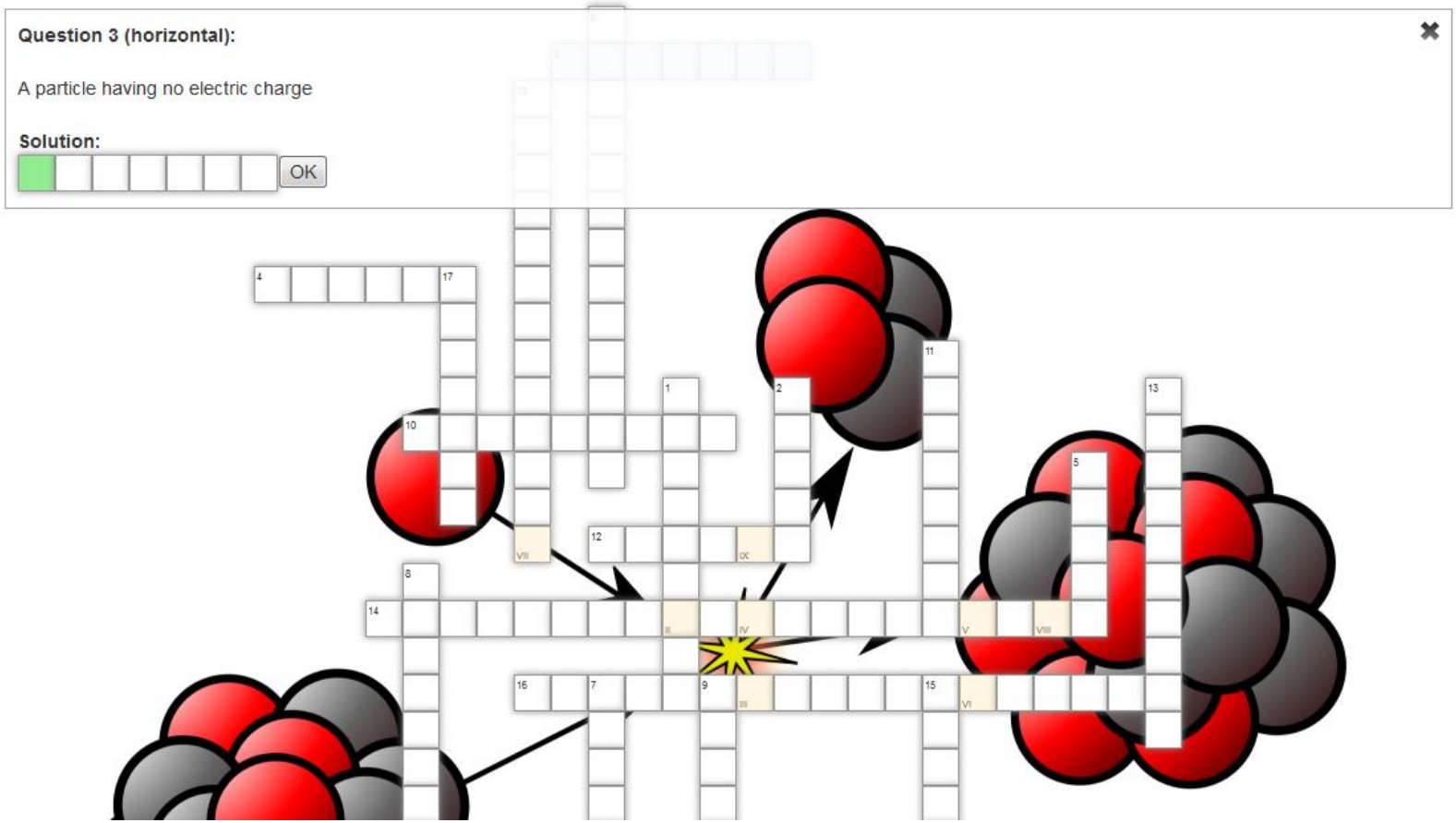
6. Activities

ICT based activities



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6. Activities

Quiz questions for assessment

socrative by MasteryConnect

Quiz name: Teszt4_aprilis19
Question with Most Correct Answers: #4
Question with Fewest Correct Answers: #6

Date: 04/26/2016
Total Questions: 10

1. Egyik autó kötéllel vontatja a másikat. Óvatos indulással a vontatott jármű akármilyen sebességre gyorsítható. Hirtelen indulásnál a kötél mégis elszakad. Miért? (A súrlódástól tekintsünk el.)

3/19	A	A vontatott kocsi csak kis gyorsulással indulhat, mert viszonylag nagy a tömege.
5/19	B	Adott impulzusváltozást rövidebb idő alatt csak nagyobb erő képes létrehozni.
7/19	C	A vontatott autó adott sebességváltozásához hosszabb idő kell.
2/19	D	A kötél szakítószilárdsága függ a vontatás sebességétől.

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6. Activities

Quiz questions for assessment

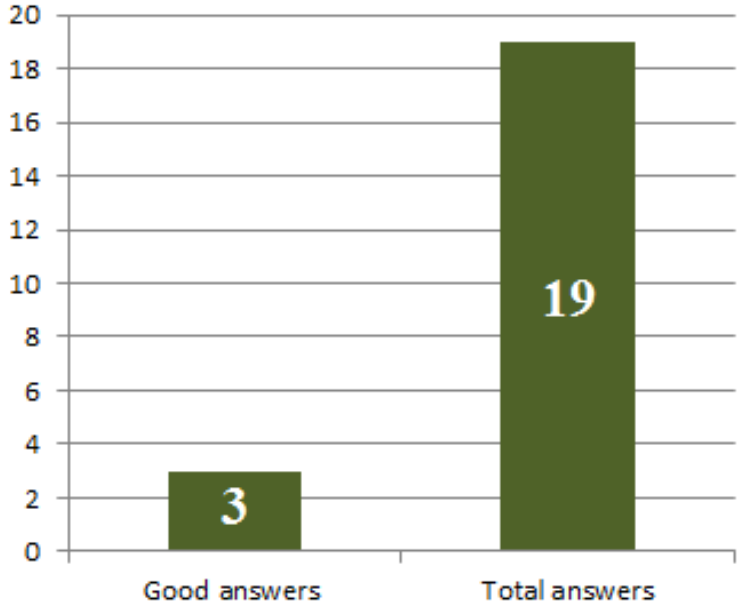
Which statement is true for a perfectly inelastic collision?

a) only the momentum is conserved

b) only the energy is conserved

c) both the momentum and the energy are conserved

d) none of the momentum and the energy is conserved



7. Summary/ Conclusions

ICT

Source

Information and communication Technology

and interactive activities improved students' core competencies

- researching,
- questioning,
- critical thinking,
- problem solving,
- decision making
- computational competencies.

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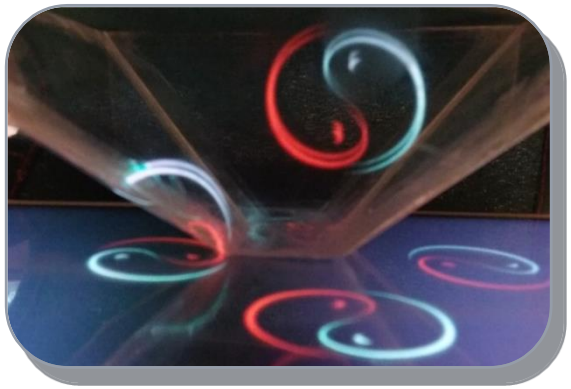
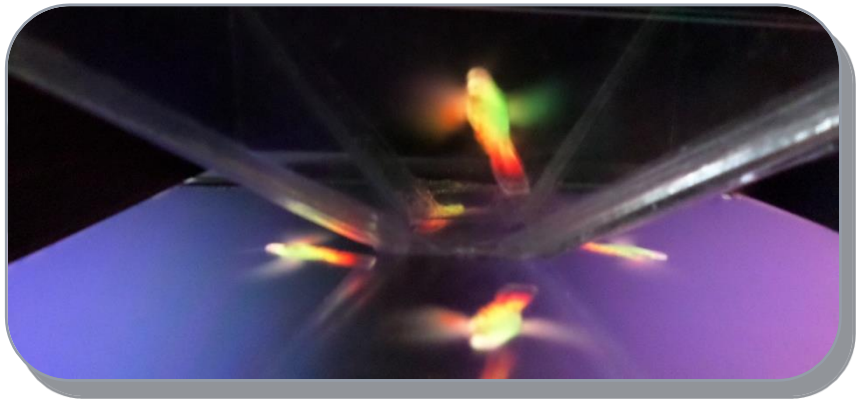
Nobel prize winner for holography: 1971

Turn your Android device to a 3D Projector ! **It is not a Hologram !**





Thank you for your attention!

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