ICT AND MULTIMEDIA IN PHYSICS EDUCATION

GIREP-ICPE-EPEC 2017

3rd-7th July 2017,
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COLLEGE PROFESSOR

DENNIS GABOR COLLEGE

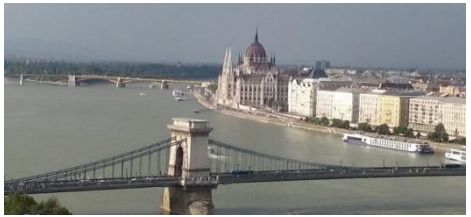

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TABLE OF CONTENTS

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1. Introduction

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

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 *(Jarosievitz, 2009)*

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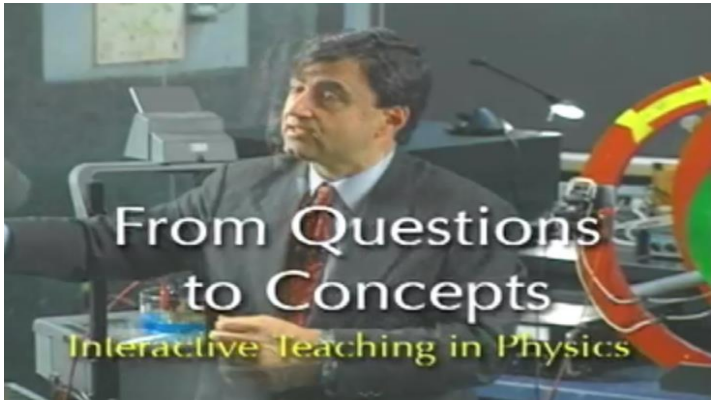
1. Introduction

Key question: „Are we teaching the right thing?”

Source: Understanding or memorization by ***Eric Mazur****, in Conference on the Introductory Physics Course, Ed. Jack Wilson, pp. 113-124 (Wiley, New York, 1997). CRLF*



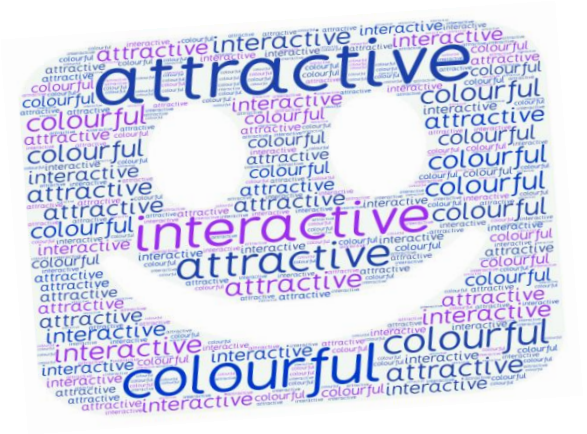
Source

1. Introduction

- we should act immediately to change students' attitude *(Richard, 2016)*

Action plan

- **physics** classes should be made more



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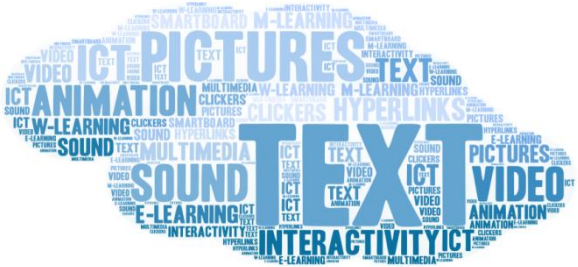
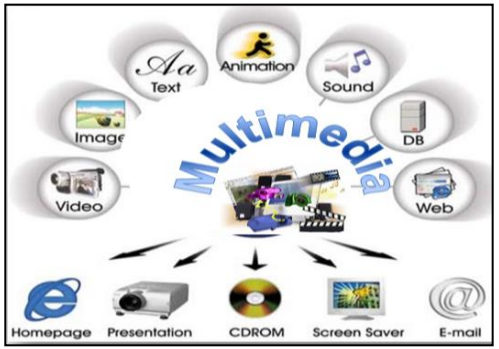
2. Questions

What can we do

We should use:





- **ICT**
- Multimedia
- interactive teaching activities and resources (e-learning content)
- m-learning devices (BYOD)
- good methods

(Jarosievitz, 2016, 2017)

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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

4. Participants

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

} from DGC

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

5. Methods: for using ICT in Physics Education

Lecture Method

- used for example for introduction of each chapter of physics

Cooperative method (Jigsaw)

- used for group-work activity (experiments' set-up), assessment collaborative learning

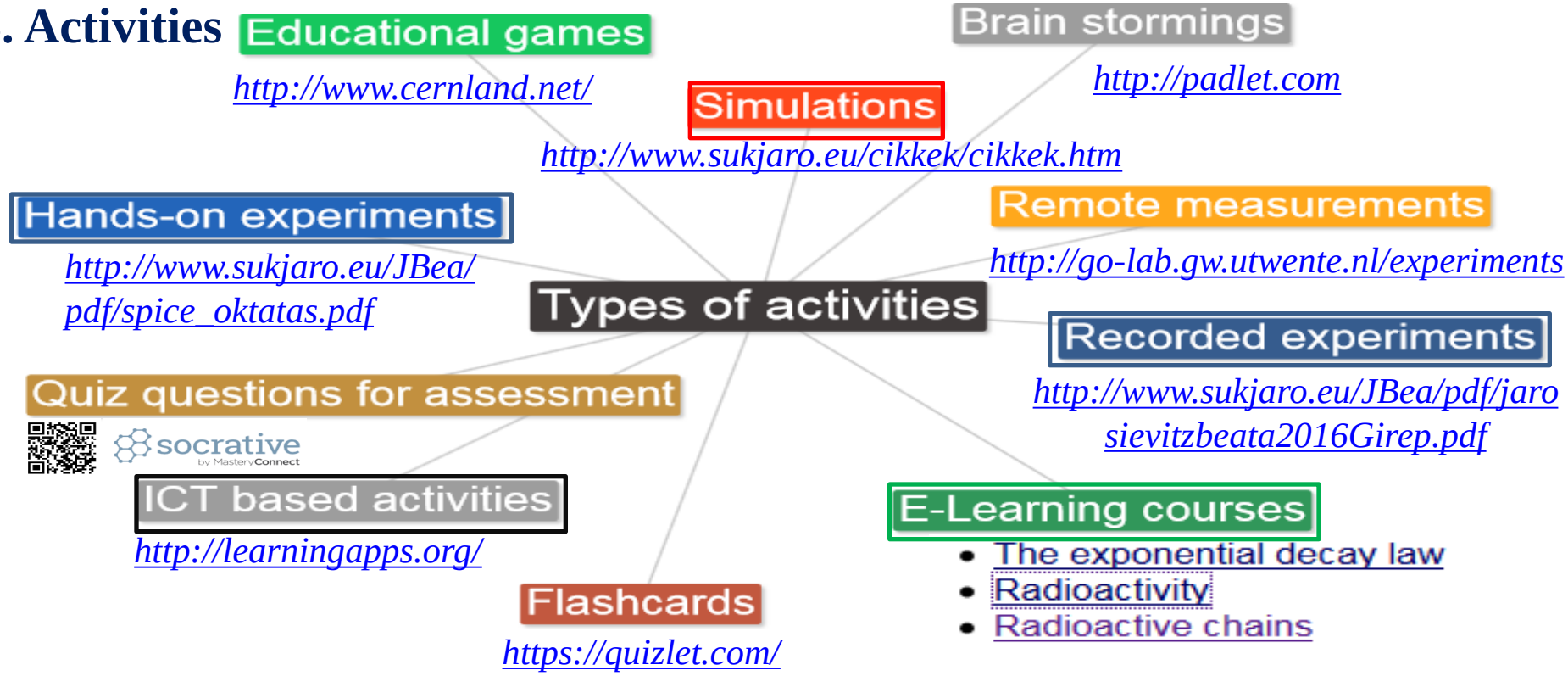
Inquiry-based learning

Hypothesis → Observation → Analyzing → Interpreting → Conclusion

Flipped classroom (peer instruction)

(Mazur 2014; Jarosievitz, 2017)

6. Activities



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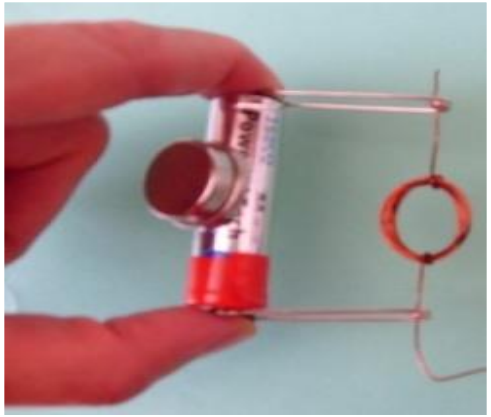
6. Activities

Hands-on experiments

Learning by doing

Newtons' law



Electric motors

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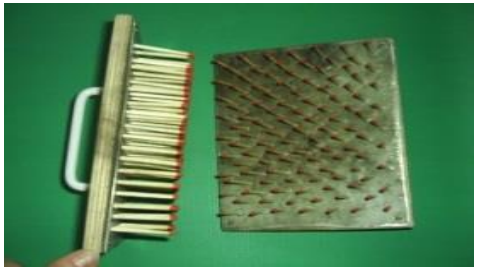
6. Activities

Recorded experiments

Chain reaction



6. Activities

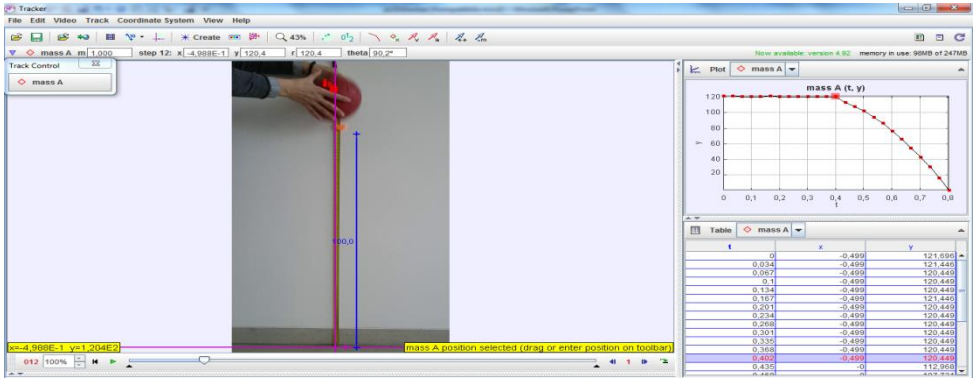
Recorded experiments

Measurements (BYOD)

Necessary materials :

- Handball (any medium sized, well visible ball)
- ruler
- smart phone or tablet
- laptop
- free program: *(http://physlets.org/tracker)*

Tracker
Video Analysis and Modeling Tool



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:

$a = \frac{g}{2} \Rightarrow g = 2 \cdot a$

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

Felvett videófájl neve	a	g (m/s²)	$x_á = \frac{\sum x_n}{n}$	$(\Delta x)^2$	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			

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

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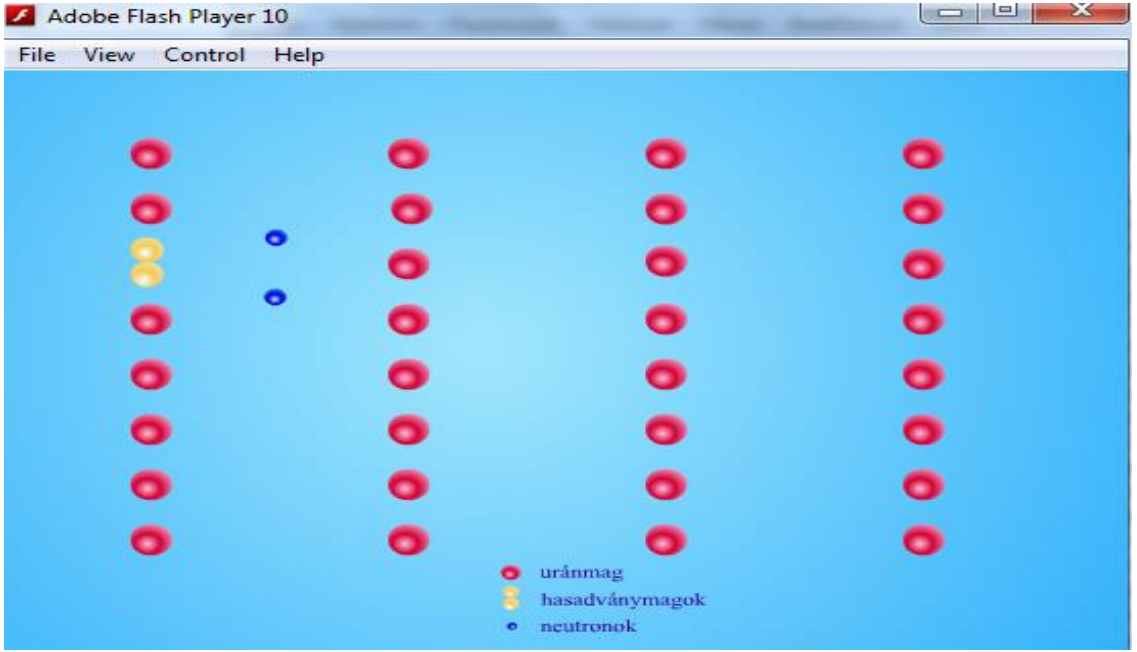
6. Activities

Simulations

Nucleus

Fission fragments

Neutrons



Simulated chain reaction (*See more*)

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6. Activities

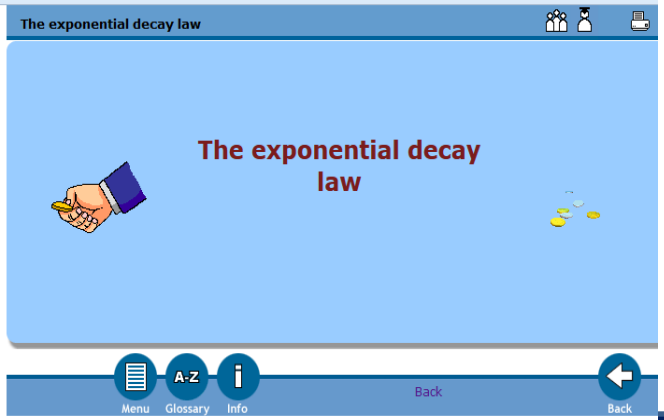
E-Learning courses

Learning FÓRUM MINŐSÉGI DÍJ | 2016

Resources - online courses

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

- The exponential decay law
- Radioactivity
- Radioactive chains



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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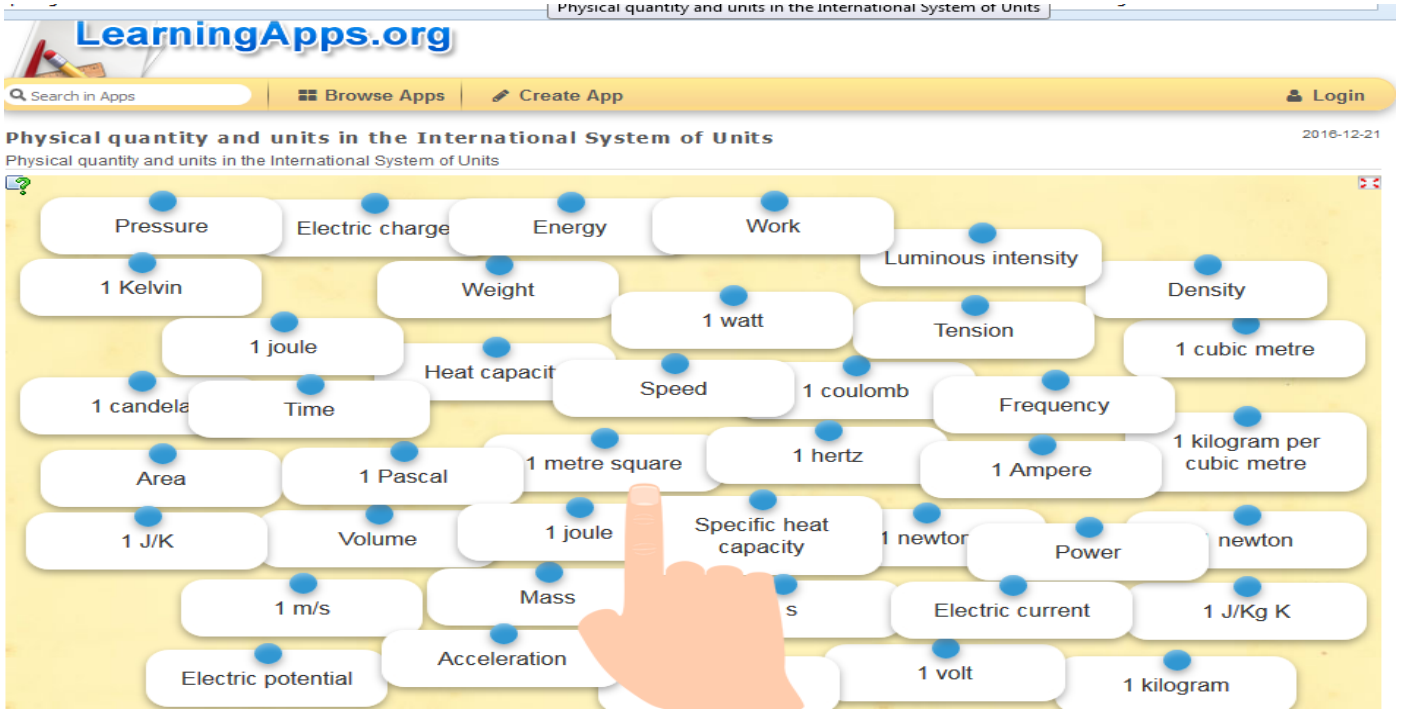
6. Activities

ICT based activities



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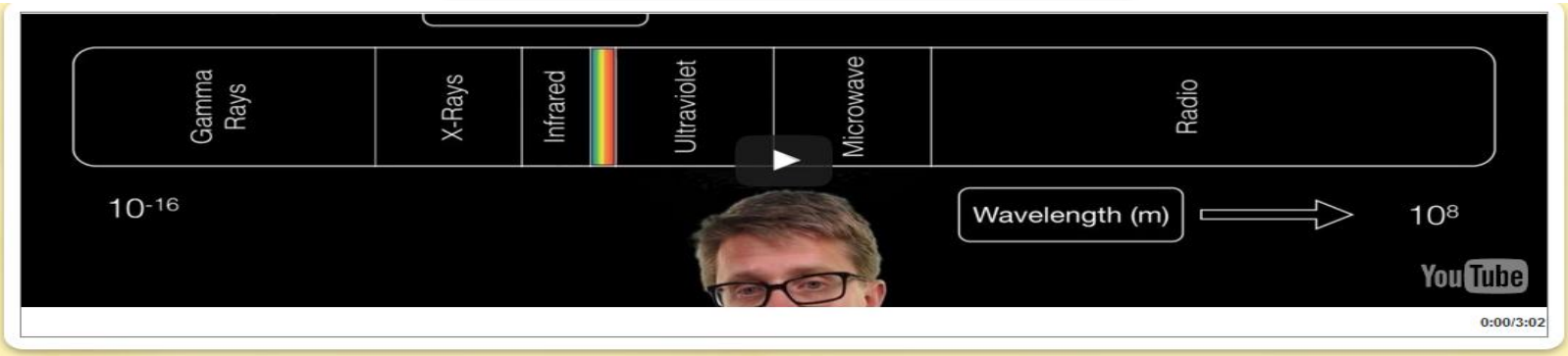
6. Activities

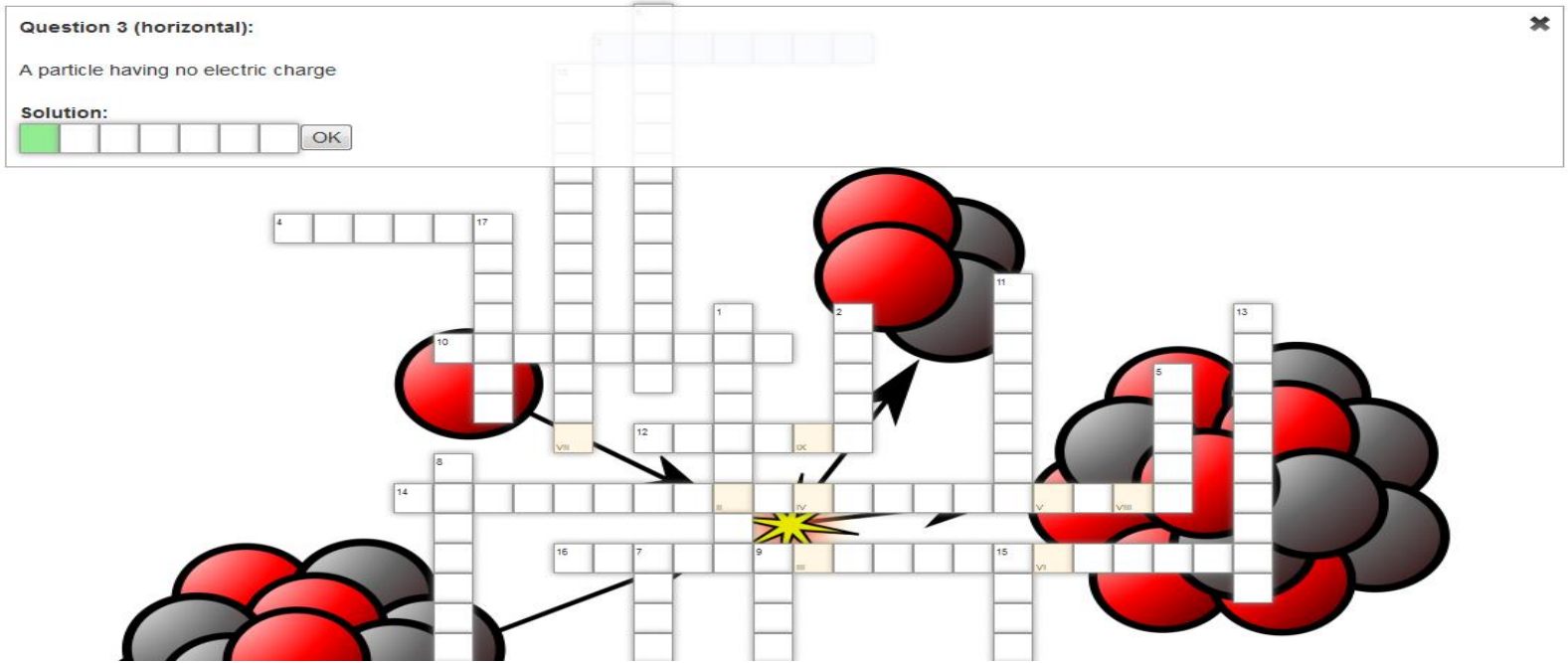
ICT based activities



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.

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

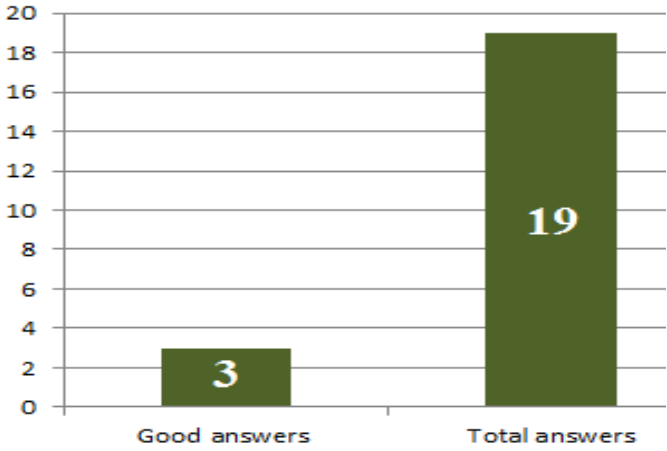
Which statement is true for a perfectly inelastic collision?

a) only the momentum is conserved

b) only the energy is conserved

c) both the momentum and the energy are conserved

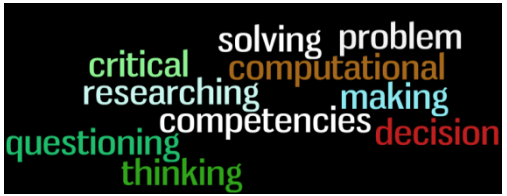
d) none of the momentum and the energy is conserved



7. Conclusions • very positive feedback from students: **personal interviews**

Students who had joined the activities:

- took part with **enthusiasm**,
- **enjoyed „learning by doing”** (experiments, use of their smart phones and tablets)
- **cooperated with their** neighbours „Turn To Your Neighbours” (*Mazur , 2014; Le Roux , 2013*),
- **used their own devices** with expertise,
- **improved their core competencies**



7. Summary

ICT

„…ICT will affect the complete learning process today and in the future.”

(Yves Punie, Dieter Zinnbauer and Marcelino Cabrera, 2012)

References









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Future plans:

- to promote physics,
- to change students' negative attitude to physics!

Thank you for your attention!

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