

EXPERIENCES IN TEACHING SCIENCE FROM CHILDREN TO ADULTS

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Beáta Jarosievitz¹ Dr. Phd.

College professor

(Physics teacher)

and

Hasznosi Tamásné²

(Physics teacher)



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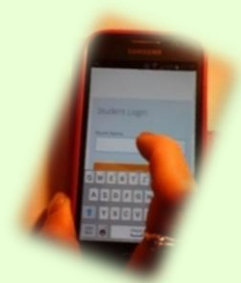
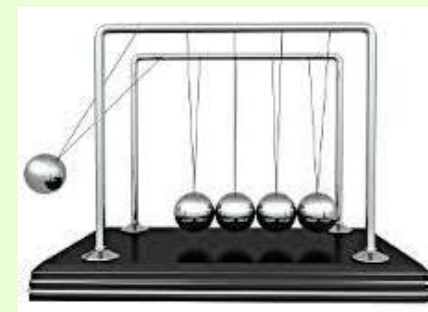
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1. Introduction

Well known problems

- the **traditional physics** classes do not **attract our students**
- the popularity of „Physics” classes must be increased
- students have at least one digital device (tablet, smart phone), but usually do not use them for study



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2. Hypotheses

- **Hands-on activities engage students to form useful scientific concepts**
- Exercises with real-life scenarios bring our students closer to Science
- Colourful digital classes **rise up the lectures' attendances.**
- **Game-Based Learning** motivates students to learn more.
- **The use of mobile devices for home-made experiments make the physics education more effective.**

OUR EXPECTATION: students will be more interested and involved

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3. Teaching methods

“teaching method” refers to the general principles:

pedagogy and management strategies used for classroom instruction

Depends on:

- educational philosophy,
- classroom demographic,
- subject area(s),
- available laboratories or resources,
- subject curricula,
- or school (univ.) mission statement.

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3. Teaching methods

3.1. Cooperation

Activity planned

group work done by 2-3 students

Aim of the activity: study of the **Newton's laws**

How ?

- with different experiments,
- simulations
- etc.



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3. Participants

- **Volunteer students**, and their exceptional tutor (Physics teacher Hasznosi Tamás Ottóné), from Sashalmi Tanoda Általános Iskola (1163 Budapest, Metró u. 3-7., Hungary) presented the hands-on Physics experiments

I am grateful and I was also honoured to work with my colleague's and her students

from

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

Dennis Gabor College,

whose study includes:

Physics course

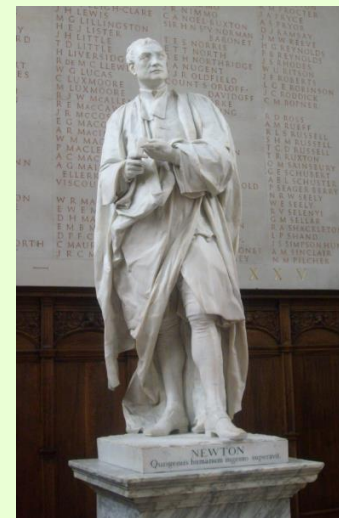
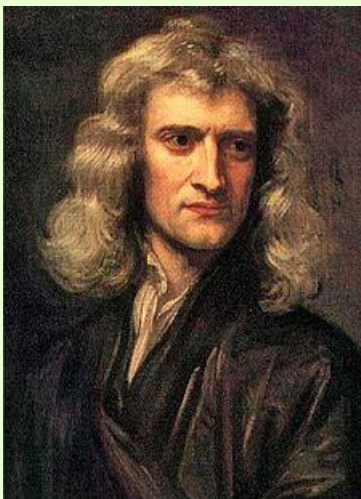
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3.1. Cooperation: study of Newton's laws

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

Did you know that the three laws of Newton are about

how and why things move?



EXPERIENCES IN TEACHING SCIENCE FROM CHILDREN TO ADULTS**3.1. Cooperation: study of Newton's laws****Newton's first law - Law of Inertia**

Objects will remain at rest or in a uniform motion along a straight line, unless acted upon by an external unbalanced force.



Please observe the following experiments

1. try to take out the paper slowly
2. take out the paper quickly, with higher speed (higher acceleration)



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3.1. Cooperation: study of Newton's laws

Newton's first law - Law of Inertia

Please observe the following experiment



- Look at the apple sitting on the skateboard.
- The skateboard with the apple is pushed by the student, and will hit the „wall”.

Have you noticed, that the apple will continue to move forward when the skateboard changed his speed and/or direction?



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3.1. Cooperation: study of Newton's laws

Newton's first law - Law of Inertia

Please observe the following experiment




- Observe: the teddy bear will continue to move forward when the skateboard changed his speed and/or direction.

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3.1. Cooperation: study of Newton's laws

Newton's first law - Law of Inertia

Please observe the following experiment 

- the egg directly fall into the glass, if its support gets removed quickly



EXPERIENCES IN TEACHING SCIENCE FROM CHILDREN TO ADULTS**3.1. Cooperation: study of Newton's laws****Newton's first law - Law of Inertia**

Please observe the following:



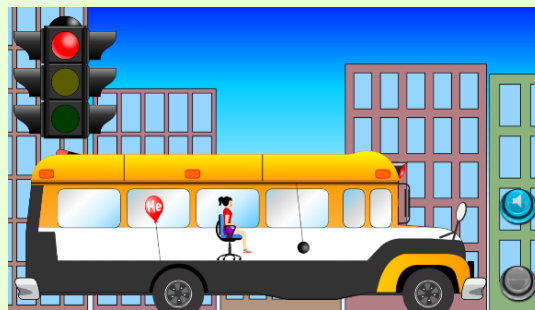
- the water from the dish will continue to move forward, even when the student's movement is blocked.



EXPERIENCES IN TEACHING SCIENCE FROM CHILDREN TO ADULTS**3.2. Simulation: study of Newton's laws****Newton's first law - Law of Inertia**

Advantages of the simulation:

- to enhance students' learning especially for online or hybrid courses and flipped classrooms
- to motivate students to learn and understand the physics law without any dangerous experiments



Source

EXPERIENCES IN TEACHING SCIENCE FROM CHILDREN TO ADULTS**3.3. Inquiry-based learning: study of Newton's laws**

Hypothesis

Observation

Analyzing

Interpreting

Conclusion

- IBL method was used for understanding: **Newton's second law**

Acceleration of an object is dependent upon two variables: the net force acting upon the object and the mass of the object.

Newton was sitting in the garden, and saw an apple fall from a tree.

He was wondering why the apple - or any object - falls down to the ground.

After several years of questioning he found out the answer.



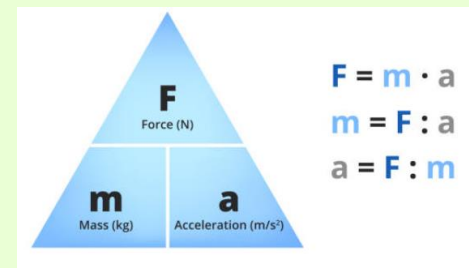
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3.3. Inquiry-based learning: study of Newton's laws

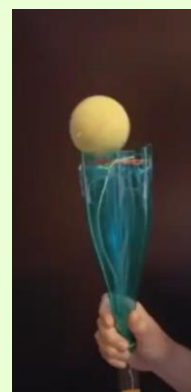
Newton's second law



Please observe the following:



- we applied equal force to lighter and heavier balls, then we observed the fact that when the mass decreased, acceleration increased.



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3.3. Inquiry-based learning: study of Newton's laws

Newton's third law



Please observe:

- students have approximately the same weight and height and both moved apart at approximately the same speed and covered the same distance.

For every action, there is an equal and opposite reaction. The force acted on one of them was the same as the force acted on the other.

EXPERIENCES IN TEACHING SCIENCE FROM CHILDREN TO ADULTS**3.3. Inquiry-based learning: study of Newton's laws****Newton's third law**

Please observe the following:

- until we applied equal forces, the rope was not moving



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3.3. Inquiry-based learning: study of Newton's laws

Newton's third law

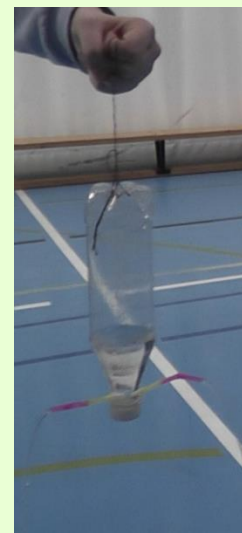


Please observe the following:

- the bottle is filled with water and is turned upside down, you can see that the bottle will start rotating automatically.



Can you guess why?



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3.3. Inquiry-based learning: study of Newton's laws

Newton's third law



- Observe the motion of the balloon and understand how the balloons and rocket engines work.



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3.3. Inquiry-based learning: study of Newton's laws

Newton's third law



Please observe the following:

- the escaping gas travels at high speed in one direction, the impact pushing the rocket in the other direction

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4. Conclusion

Students who had joined the course and been involved in the hands-on experiments:

- took part in the activity with enthusiasm,
- enjoyed the hands-on experiments,
- learned to make reflections,
- were motivated in problem solving, and thinking,
- used the advantages of cooperation,
- mastered the curriculum more deeply.

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„I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me”.

Sir Isaac Newton

[Source](#)

Thank you for your attention!