**Lesson Plane Table**

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| **Subject:** | **DIGITAL TEACHING IN PHISYCS SUBJECT – LUND, SWEDEN** | | | | |
| **Authors:** | **Teachers:** Serban Raceanu,Paul Enache,Alina Savu  **Students:** Alexandra Ștefan, Pîrvu Daniel, Felix Vișinică | | | | |
| Date: | | | | 20/11/ 2018 | |
| Estimated time: | | 50 minutes + 50 minutes |  | |  |
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| Summary: |  | | | | |

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| **Objectives**  (Specify skills information that will be taught) | **Activity/ Information**  **Teacher Guide/ Student guide** | **Materials Needed**  (Other resources - web, book...) | **Assessment Methods**  (steps to check for student understanding) | **Time**  **Where?** |
| \* acquiring knowledge about notions of physics, according to the curriculum in Romania  \* Testing knowledges  \* acquiring knowledge about Arduino programming  \* acquiring knowledge about different phenomena in physics, such as metal dilatation and contraction  \* acquiring knowledge in the sphere of physics and how we can help this knowledge in our daily lives.  ***Know Concepts or Keywords :***  - knowledge of Physics at high school;  - computer skills; | **Motivation Activities**  Do you want to know more about various phenomena in physics?  The phisycs application called **Physics 3D CNA** for Android and Windows gives you all the answers!  - Do you want to test your knowledge or test the knowledge of your colleagues? A funny way to test your physics skills by using a toycar!  -Do you want to use Arduino in a fun way?  -Learn to use Arduino for decorate things  -Do you want to see what effect the fire has on the metals? Do you want to understand what metal dilation and contraction mean?  Then follows some classical physics experiments! | * Phone * Worksheet * PC * Internet * Video-projector | * Working in application * Making the quiz and testing it * Solve tests | **In Classroom**  25 minutes+  20 minutes+  20 minutes+  15 minutes+  20 minutes |

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| **Description of the activity 1:** | |
| **Introduction** | For a better understanding of physics phenomena, they can be presented using 3D animations.  For this we can use the **Physics 3D CNA** application for Windwos. |
| **Main activity** | An animated presentation of all the phenomena from the high school curriculum that is being studied in Romania. |
| **Lesson Guide (Step by step)** | * Presentation of many phenomena in physics such as light refraction, friction forces, mechanical work, etc. with 3D highly detailed animations * Explaining all these phenomena in + accessible and attractive language * make quizzes and resolve its; |
| **Exercises (2 or 3 levels of difficulty)** | * manipulating the model, zoom, rotate; * displaying the natural pattern or divisions. * play with funny animations. |
| **Conclusion and Evaluation** | Students are interested and fascinated to see in 3D what they have learned at the course and make a virtual tour in the physics.  They check their knowledge with the quizzes they make with this application. |
| **Notes:** | The physics application called is made by a our students **Physics 3D CNA** and you can find it here:  <https://drive.google.com/drive/folders/1g6H_DTZN9HQgiZAZSgKkcit4_aES4UXE> |
| **Description of the activity 2:** | |
| **Introduction** | For those interested in physics we apply a different form of assessment: using a a toycar whose engine works with salt water. Students need to explain how they think this phenomenon is possible. |
| **Main activity** | Explaining physical phenomena in an interactive form. |
| **Lesson Guide (Step by step)** | The car is made of plastic with a small 2centimeter engine, but a battery that produces energy is made of 3 small materials: an aluminum plate, it is the first terminal, a paper to absorb salt water and drive the energy, and yet another the pleasing metal forms the 2 nd terminal.  How it works: First put the aluminum plate, then the paper is filled with salt water and metal is placed over it, it reacts and profits enough energy to move the machine for up to 3 hours of continuous use, only if we put salt water on the way , after that, in order to be used again, the metal must be replaced. |
| **Exercises (2 or 3 levels of difficulty)** | Divided into teams, students have to explain in writing how I think that engine works. The most accurate answer will turn the team that gave it to the winner. |
| **Conclusion and Evaluation** | The atmosphere is exciting and students are determined to find the right answers.  . |
| **Notes:** | The toycar whose engine runs with salt water can be bought from here: <https://www.giftology.ro/kit-robotica-masina-apa-sarata.html>  Presentation video, here:  <https://www.youtube.com/watch?v=1Hwe53imJuc#action=share> |
| **Description of the activity 3:** | |
| **Introduction** | You can learn to use Arduino led strip for decorate things. |
| **Main activity** | How to use Arduino in decorate things like your owen room or your PC. |
| **Lesson Guide (Step by step)** | Ever wondered how the chameleon changes its colour through the changes in environmental colours? There's something called Melanocyte Stimulating Hormone or MSH. The stories apart, we wanted to build ambient lighting system or something like the chameleon. This looks cool and also it helps eyes. we has a NeoPixel LED strip and a spare colour sensor. So we just built our Chameleon (electronic) using Arduino (microcontroller for everyone) as the brain.  You can find all the information about how it’s made, in the a attached PowerPoint**.** |
| **Exercises (2 or 3 levels of difficulty)** | * Have fun with programming strip led on Arduino; |
| **Conclusion and Evaluation** | Students learn new things about programming Arduino and how you can use this in a very fun way! |
| **Notes:** | **Presentation video:** <https://www.youtube.com/watch?v=-wrkIzEo6Ls#action=share> |
| **Description of the activity 4:** | |
| **Introduction** | Learn about the dilation and contraction of metals in a classic way! |
| **Main activity** | Learning new things about the metal using traditional experiments (the expansion of different metals) |
| **Lesson Guide (Step by step)** | * installing tools used for experiments;   - for the first one, we need a stand with a tray filled with cotton wool dipped in some spirt and two bars(one made of iron and one made of aluminium)that are going to be placed above the tray. We fire the cotton wool and shortly, we notice that the bar that is placed above the tray is starting to climb. The aluminium bar is climbing faster than the iron one, because aluminium dilates faster than iron.  -for the second one, we need a stand on which we hang a ball(made of copper or aluminium), a spirt lamp that is going to be placed under the ball, a lighter, and a circle made of metal. At first, we notice that the balls can pass through the circle. We light the lamp using the lighter. After some time, we notice that the ball can’t pass through the circle anymore. |
| **Exercises (2 or 3 levels of difficulty)** | * learn new things with interactive lessons; * performs experiments |
| **Conclusion and Evaluation** | Classical experiments bring extra interest from students because by testing live what happens in different situations, they can better understand the phenomenon. Although computer simulations or mobile phones are very attractive and easy to use, we should not forget the classic, real-world experiments. |
| **Notes:** |  |

**Bibliography**

* IT books used in our high-school for different level of education
* Physics books used in our school.
* Internet sources.