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KA229 - Cooperation for Innovation and the Exchange of Good Practices
2019-1-RO01-KA229-063584.

STEAM ACTIVITIES in Secondary School



Participating countries:



LICEUL TEORETIC „SALAMON ERNŐ”



AGRUPAMENTO DE ESCOLAS DO VISO – PORTO



ZESPOL SZKOL NR 1 W PRZYSIETNICY



ŠKOFIJSKA GIMNAZIJA VIPAVA



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STEAM Lesson Plan

Category: Science, ICT, Maths

School	Liceul Teoretic Salamon Ernő, Romania
Date	03.12.2019.
Students	5 International groups
Teacher	Barabas Tibor, Gorgicze Eموke

Overview: After the students have learned during the CLIL activity what healthy foods are, they do some experiments to see if the foods we buy really have what we expect

Suggested time: one to two class periods depending on completing the extension activity.

Materials:

- Lugol reactive
- natural cream, commercial cream and cream prepared by us
- Sudan III reactive
- red pepper
- different types of maionaise
- Milk, albumen and reactives (NaOH and CuSO₄)
- Dangerous E-numbers list
- worksheets
- calorie table

Objectives:

- To engage in experiential learning
- To develop problem-solving
- To embrace collaboration, and work through the creative process.



Planned activities:

Did you take the lunch? This was a healthy lunch? Then we can continue the play with food nutrients. Often the people cheat with food to take profit. In our experiments we will know some ways to unmask cheating or demonstrate the content of food. You have some experiments, different for each group. One of you need to pick up a safety jacket, to protect your cloths. Be carefully in work, for your safety, and be cautious in handling chemicals.

Group 1

1. In many places people cheat on the quality of food. For example, the cream is prepared from milk with flour. It will not be the real cream. How can you detect fraud?
2. One of demonstration methods is reaction with Lugol reactive. The Lugol reactive is $KI+I_2$, is utilized for disinfection. This can react with amidon in flour by coloring this in violet. You can use this reactive to demonstrate if your cream is prepared or not. For demonstration we can use natural cream, commercial cream and cream prepared by us.
3. Procedure: drop some Lugol drops in test tube which contains one of these cream. Observe colour reaction.
4. Write on worksheet every step of your work, and make some conclusions.

Group 2

1. In many places people cheat on the quality of food. For example, the maionaise may be prepared artificially. It will not be the real maionaise. How can you detect fraud?
2. What do you need? Home made maionaise, commercial maionaise and oil, reactive and chic \square . To demonstrate the presentation of fat, you need Sudan III reactive. But this reactive is very expensive and rare. So you can use red pepper. This react with fat, by coloring in orange.
3. Procedure: add a few red pepper to test tubes containing different types of maionaise. Usually in maionaise exist oil (fat). If containing fat, then the colour will turn in red.
4. Write on worksheet every step of your work, and make some conclusions.

Group 3



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1. In many places people cheat on the quality of food. For example, the milk or products from egg may be modified artificially. It will not contain proteins. How can you detect fraud?
2. What do you need? Milk, albumen and reactives. The name of process is Biuret-reaction. Used reactives are NaOH and CuSO₄. They will color the proteins in blue, blue-violet.
3. Procedure: add a few CuSO₄ to test tubes containing milk, or albumen. Then add NaOH and wait until appear colour reaction. If the material contains protein, the colour will turn in blue-violet.
4. Write on worksheet every step of your work, and make some conclusions.

Group 4

1. Have you ever wondered what chemical ingredients are in pre-packaged products?
2. Use the packaging materials found on the table and find the ingredients, then the preservatives, dyes, stock improvers and their codes.
3. find the E-numbers found on the packaging from Dangerous E-numbers list
4. Write on worksheet every step of your work, and make some conclusions

Group 5

1. Have you ever wondered how many calories are in pre-packaged products?
2. Use the packaging materials found on the table and find the ingredients, and their calorie value
3. Calculate how many calories are we consume, during a day, a night, when just staying and chewing
4. Write on worksheet every step of your work, and make some conclusions

Final activity:

Every group is presenting their conclusions and results, the others are listening.



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STEAM Lesson Plan

Category: Literature, drama, ICT and Arts and crafts

School	Liceul Teoretic Salamon Ernő, Romania
Date	03.12.2019.
Students	6 International groups
Teacher	English-Romfeld Katalin

Overview: After exploring and analyzing the fable **Lead, the little soldier**, students give different interpretations to the text, contextualize and role-play various lifelike situations a royal guard might have to solve. Students demonstrate their understanding of the fable by creating art in their own style using the tokens collected in the CLIL lesson.

Suggested time: one to two class periods depending on completing the extension activity.

Materials:

- **Worksheets 1-5**
 - drawing paper
 - colored pencils
 - thin black marker
 - Various raw materials like yarn, glass, plastic balls, cork, cotton etc.
 - Tokens
 - Other recyclable materials like paper rolls, straws etc

Digital resources designed by teacher

- kahoot : <https://play.kahoot.it/v2/lobby?quizId=f305eba6-a214-4d0d-ae52-0e3022d8a71d>

Objectives:

- To engage in experiential learning



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- To develop problem-solving
- To embrace collaboration, and work through the creative process.
- To practice the 4Cs of the 21st century skills: communication, collaboration, creativity, critical thinking

Stages:

1. Lead-in : individual work

Students solve a kahoot quiz related to royal guards to activate their knowledge related to the topic.

2. Introduction:

Group work: The teacher presents the task and hands out the chosen worksheet to each group of students, who will have 15' to complete the task presented on it. The best groups get tokens. These worksheets focus on enhancing collaboration and communication among the students while role-playing the following tasks:

- 2.1. Write and act out an interview with one of the Queen's guards.
- 2.2. Royal Guards March While Singing
- 2.3. A royal guard's resignation letter
- 2.4. Changing the guard
- 2.5. Entrance exam for joining the Household Cavalry

Students perform their roles in front of the others, and opt for the best interpretations and roles, reflect and comment on the others' performances.

3. Arts and crafts or DIY: group work

With the tokens gathered in the previous sections, the students "buy" the materials they would like to use to make their own royal guard. Besides these components, each group gets a basket of necessities, like scissors, glue, tape, markers, pins etc. to use. The students will design and build their own guard and present it to the rest of the class.



WORKSHEET 1

Write and act out an interview with one of the Queen’s guards.

Imagine that you have been interviewing a guard. Here are his answers; complete the questions. You should also add some other questions!

You: Are you allowed to?

Guard: Oh no, never. That’s against the rules!

You: Have you?

Guard: Of course not! Not once in my life!

You: Do you?

Guard: No, this is just one of our jobs.

You: Are you?

Guard: Well we’re some of the best trained soldiers in the British Army, so we do lots of things.

You: Do you.....?

Guard: Of course we do.

You: Have you.....?

Guard: Yes, I was with the international forces in Afghanistan.

WORKSHEET 2

Royal Guards March While Singing

Royal Guards often play funny songs while marching. Write a marching song and perform it. You can use music background, improvised instruments etc.

(help: Swedish Royal Guards Perform “Hooked on a Feeling”- youtube)

<https://www.youtube.com/watch?v=whfkVYPP3h8>



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WORKSHEET 3

A Royal Guard's resignation letter

Write a royal guard's resignation letter to his officer complaining about various aspects of his job. Then act out a scene: Mr. Johnson, after receiving the letter, invites his colleagues to the nearest pub and divulges its content to them. The others react to it using a bit too "personal" tone.

WORKSHEET 4

Changing the guard

Changing the guard is a formal ceremony in which sentries performing ceremonial guard duties at important institutions are relieved by a new batch of sentries. The ceremonies are often elaborate and precisely choreographed.

Role-play such a change with two royalties as observers commenting upon the event.

WORKSHEET 5

Entrance exam for joining the Household Cavalry

The **Household Cavalry Mounted Regiment** (HCMR) is a cavalry regiment of the British Army tasked primarily with ceremonial duties. Part of the Household Division, it is classed as a regiment of guards, and carries out mounted (and some dismounted) ceremonial duties on State and Royal occasions.

Work out some exam tasks and role-play an entrance exam with both officers and candidates. Pay special attention to the intellectual and physical requirements a candidate must (or why not: can't fulfil)!



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.... and some final products:





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STEAM Lesson Plan

Category: Science, Maths, ICT, Art

School	Liceul Teoretic Salamon Ernő, Romania
Date	05.12.2019.
Students	6 International groups
Teacher	Bíró Zoltán, György Éva

Overview: The students will become familiar with the geographical, historical and literary concepts about the St Anne Lake they will use during the CLIL activity. Art and mathematics group activity: drawing a carriage, approximate the area and the perimeter of the lake.

Suggested time: 45 min.

Materials:

- videos
- worksheets
- maps
- colored pencils, papers

Objectives:

- To engage in experiential learning
- To develop problem-solving
- To embrace collaboration, and work through the creative process.

Planned activities:

- Identify the geographic location of Hargita county and St. Anna Lake
- Discovering the volcanic chain of the Carpathians and the conditions of the formation of the lake.
- Watching a video about the legend of the lake
- Creating/drawing a picture of the carriage featured in legend



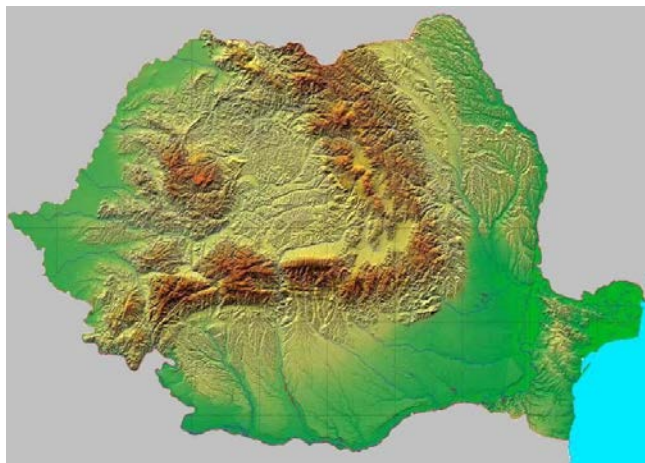
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Saint Anne Lake

Romania - Harghita county



The Carpathians



Saint Anne Lake





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- Saint Anne Lake is the only lake in Romania is located in a volcanic crater.
- Together with Mohos-tőzegláp located in adjacent crater, form a Natural Reserve of Mohos.
- Lake Saint Anne is in Csomád Mountains, 55 km of Csíkszereda, but it is near Tusnád Fürdő resort.



Watching a video about Harghita county.

- The lake is at an altitude of 949 m.
- It has an oval form and its surface area is 19.3 ha .
- Walking, we can go around it.



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- Specific for the lake is that it does not feed from springs or brooks, but only from precipitation.
- Therefore the degree of mineralization of the water is very low.
- In winter, the lake is covered with a layer of ice of up to 1 m.
- Near the lake there is a Roman Catholic chapel dedicated to Saint Anne built in 1977 instead of the old chapel. The old chapel was built of wood in 1564 it was rebuilt of stone.



- Watching a video about the legend of St. Anne lake.

Group activity:

1. Imagine the carriage featured in the St. Anne legend.
2. Use the colored pencils and create a picture of this carriage.
3. On your opinion how big is the lake? Approximate the area and the perimeter.
4. Write on worksheet every step of your work, and make some conclusions

Final activity:



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Every group is presenting their conclusions and results, the others are listening.



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STEAM Lesson Plan

Category: Chemistry

School	Zespół Szkół Nr 1 w Przysietnicy
Date	05.10.2021
Students	6 International groups
Teacher	Chemistry teacher-Katarzyna Kociuba

Overview: After participating in the CLIL chemistry lesson, the students, being aware of liquid solubility, are given the task which is making homemade soap.

Suggested time: two class periods

Materials:

chemical reagents

Objectives:

- To develop problem-solving
- To enhance collaboration, and work through the creative process.
- To practice the communication, collaboration, creativity and critical thinking



STEAM CHEMISTRY LESSON:

I Presentation/practice stage:

The teacher welcomes the pupils and reminds them of the concept and definition of solubility. Short presentation is played to let ss predict what the next step during the STEAM lesson will be.

<https://www.youtube.com/watch?v=zVz6o08g5Po>

II Production stage:

Ss are given the instructions to make a homemade soap.

HOMEMADE SOAP - Instruction

Prepare the reagents:

- ✓ Measure 59g of **NaOH**
- ✓ Measure 170g of **distilled water**

Carefully add NaOH do distilled water.

Use caution- lyefumesarecaustic !!!!

Letcool to 35⁰C.

-
- OliveOil (227g)
 - Palm Oil (85g)
 - CoconutOil (142g)
 - Essential Oil

Mix oils together and heat to 40⁰C.

Add a few drops of fragrance.

Carefully pour in lyewater.

Pour in to molds.

Cover molds and leave undisturbed for 24 hours.

Lay out bars on cardboard and allow to cure for at least 60 days.



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Questions after the experiment:

1. What reactions are used to make soaps? What types of soaps do you know?
2. What is the name of the reaction leading to soaps using animal fats?
3. When fats are saponified, is only soap obtained? Choose a,b or c.
 - a. Yes. Only soap is obtained.
 - b. No. Water is also obtained.
 - c. No. Glycerine is also obtained.



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STEAM Lesson Plan

Category: Geography

School	Zespół Szkół Nr 1 w Przysietnicy
Date	06.10.2021
Students	6 International groups
Teacher	Geography – Justyna Zubel

Overview: After participating in the CLIL geography lesson, the students, being aware of what the UNESCO list is, are given the first task, which is to name a heritage site in their country. By participating and communicating correctly, the pupils demonstrate their understanding of the topic, which they also say they like.

Suggested time: 90 minutes

Materials:

- a) worksheets**
- b) a geographical atlas;**
- c) a multimedia presentation,**
- d) a crossword puzzle**

Objectives:

- To engage in experiential learning
- To develop problem-solving
- To embrace collaboration, and work through the creative process.



- To practice the 4Cs of the 21st century skills: communication, collaboration, creativity, critical thinking

Stages of the STEAM GEOGRAPHY LESSON:

Introduction:

Group work: The T presents the task and hands out the chosen worksheet to each group of students, who will have 15' to complete the task presented on it.

Worksheet 1

Write answers to the following questions (questions to which you will find answers in the presentation)

1. How many Unesco sites are there in Poland?
.....
2. Which site was one of the first to be inscribed on the Unesco World List?
.....
3. In which year was the Bochnia Salt Mine inscribed on the Unesco list?
.....
4. How many prisoners went through Auschwitz?
.....
5. On which border is the Białowieża Forest located?
.....
6. Which city center was destroyed by Nazi troops in 1944?
.....
7. Which city was founded by Chacellor Jan Zamoyski?
.....
8. In which city is the Teutonic Castle located?
.....
9. On both sides of which river lies Maskauer Park?
.....
10. How many Orthodox churches are located on Polish side and how many on Ukrainian side?
.....
11. In which mine part of the route must be travelled by boat?
.....
12. Which object was inscribed on the Unesco list in 2019?
.....



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Worksheet 2

Using the physical map of Poland provided in the geographical atlas, calculate the distance in a straight line between the towns: Brzozów and Cracow. Then read the scale of the map and make appropriate calculations. This way you will know how many kilometers of road await you tomorrow. Also calculate the distance between Cracow and Wieliczka.





Worksheet 3

EXERSICE 7

Solve the crossword puzzle

We solve the crossword together on the board.

The group that knows the answer writes the solution on the board.

Write down the password:

PASSWORD:

CROSSWORD PUZZLE QUESTIONS:

1. Teutonic Castle in
2. Polish Capitol.
3. In this city there are more than 1 100 Gothic style buildings.
4. Centennial in Wrocław.
5. Park.
6. This city you will visit tomorrow.
7. Zebrzydowska.
8. Town with a salt mine.
9. It was mined in a mine in Tarnowskie Góry.
10. Churches of in Jawor and Świdnica.



Worksheet 4

Participants draw sets containing selected Unesco sites in Portugal, Romania, Slovenia and Poland. After drawing the sets, they execute the task: present a short description (2 - 3 sentences) of the Unesco sites drawn by your group. Prepare it as a multimedia presentation on laptops. Each group presents the results of their work.

GROUP 1 -Unesco sites:

- a) AltoDour
- b) Danube Delta
- c) Scotch Caves
- d) Wooden church in Haczów

<https://docs.google.com/presentation/d/1L4EE0Tg7d4266ECiy5j-kS19UXlX/edit?usp=sharing&oid=106309663079156209323&rtpof=true&sd=true>

GROUP 2 - Unesco sites:

- a) Old Town of Evora
- b) Monastery of Horezu
- c) Prehistoric stilted settlements
- d) Wooden church in Blizne

<https://docs.google.com/presentation/d/1x5Flout1mNTw5UH7CqdBK43LSW-3ISUE/edit?usp=sharing&oid=106309663079156209323&rtpof=true&sd=true>

GROUP 3 - Unesco sites:

- a) Cambra University
- b) Dacian Fortresses
- c) Mercury mines of Almaden and Idria
- d) Wieliczka Salt Mine

https://docs.google.com/presentation/d/1YhyNubRKvb7UlayikQqL0BPML_uz1pj4/edit?usp=sharing&oid=106309663079156209323&rtpof=true&sd=true

GROUP 4 - Unesco sites:

- a) Hieronymite Monastery
- b) Wooden Orthodox churches of Marmara
- c) Original beech forests of the Carpathians
- d) Old City of Cracow

<https://docs.google.com/presentation/d/1Jwwlg0UPdGPNEVAJDydB2KBsrX4fbYIJ/edit?usp=sharing&oid=106309663079156209323&rtpof=true&sd=true>



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GROUP 5 - Unesco sites:

- a) Laurel forests
- b) Defensive Churches of Transylvania
- c) Slovenia has very few Unesco-listed sites. Question for the participant from Slovenia:
which sites (2 examples) should be on the Unesco list and why these?
- d) Wooden church in Smolnik



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STEAM Lesson Plan

Category: Arts, History, Math and Crafts

School	Agrupamento de Escolas do Viso (Porto)
Date	6.4.2022
Students	6 International groups
Teacher	Arts, Sílvia Portela

Overview: Practical work in order to recognize and build tile patterns obtained by compositions of geometric transformations (translation, reflection and rotation), with the use of drawing instruments.

Suggested time: two to three class periods

Materials:

- drawing paper
- pencils
- colored pencils
- thin black marker
- worksheet
- scale
- square
- compass

Objectives:

- To engage in experiential learning
- To develop problem-solving
- To embrace collaboration, and work through the creative process.
- To practice the 4Cs of the 21st century skills: communication, collaboration, creativity, critical thinking



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Stages:

	Procedure of the lesson	Brief argumentation
Stage 1: Introduction		
IP:	Students are asked to sit around the tables in predetermined groups of 5-6. They are presented with colour markers and blank sheets of white paper.	To explain the tasks and prepare the students for their group work.
Time:	I tell remember the students the viewing of tiles in a pattern by repetition/translation, repetition/rotation and repetition/reflection. 5-10 min	
Stage 2: Arts' Work		
IP:	The challenge given to the students is to complete the symmetry of one of the examples of tiles they found in the various buildings in the city of Porto. Draw and color.	To present the topic in an engaging, visually appealing and integral way.
Time:	50-60 min	
Stage 3: Evaluation		
IP:	Having completed all of the task and their artwork displayed, the students are presented with the evaluation of their work. The resulting work can be viewed on display and later delivered to students.	To evaluate students' work and draw conclusions regarding the topic.
Time:	I thank the students for their participation and wish them all the best during their stay in Porto. 10 min	



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STEAM Lesson Plan

Category: History, ICT, Math, Arts and crafts

School	Škofijska Gimnazija Vipava
Date	9.5.2022
Students	6 International groups
Teacher	History, Luka Kompara

Overview: Students are asked to sit around the tables in predetermined groups of 5-6. They are presented with colour markers and blank sheets of white paper. They will have to complete three activities on the topic of the Battle of the Frigidus river. First, they would have to open their eyes and ears and memorise everything they see and hear. Afterwards, they would have to draw what they saw and translate what they heard. Later, they would have to solve some mathematical problems.

Suggested time: two to three class periods

Materials:

- drawing paper
- pencils
- colored pencils
- thin black marker
- online dictionaries and translators
- whiteboard
- speakers
- worksheet

Digital resources

Online Latin dictionary:

<http://www.perseus.tufts.edu/hopper/>



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Supplementary music video:

Legio Aeterna Victrix - Roman march. Lyrics.

<https://www.youtube.com/watch?v=VkeLkuFzPfM>

Objectives:

- To engage in experiential learning
- To develop problem-solving
- To embrace collaboration, and work through the creative process.
- To practice the 4Cs of the 21st century skills: communication, collaboration, creativity, critical thinking

Stages:

	Procedure of the lesson	Brief argumentation
Stage 1: Introduction		
IP:	<p>After a short break we transfer to the exam hall in the school attic.</p> <p>Students are asked to sit around the tables in predetermined groups of 5-6. They are presented with colour markers and blank sheets of white paper.</p> <p>I tell the students that they will have to complete three activities on the topic of the Battle of the Frigidus river. First, they would have to open their eyes and ears and memorise everything they see and hear. Afterwards, they would have to draw what they saw and translate what they heard. Later, they would have to solve some mathematical problems.</p> <p>Then, I announce the visit from a very special guest (a student dressed as a Roman soldier).</p>	To explain the tasks and prepare the students for their group work.
Time:	5-10 min	



Stage 2: Group Work		
IP:	<p>1. A student, dressed as a Roman soldier, enters the hall to the sound of a Roman march. He marches around the tables, while the students attempt to memorise the details of his attire and draw the picture on a blank sheet of paper using colour markers. After the music stops, the Roman soldier stops in front of the students and recites a text in Latin, which they are asked to translate to English, with the help of online dictionaries:</p> <p><i>Avete! Ego miles Romanus sum. Caesari Teodosio servio. In hanc regionem veni regnum et religionem Christianorum defensum. Alea iacta est - nunc bellum paratum est. Ad maiorem gloriam Romae! Vae victis!</i></p> <p>Translation in English <i>Hail! I am a Roman soldier. I serve Caesar Teodosius. I came into this country to defend the kingdom and religion of the Christians. The die is cast - now the war is ready. To the greater glory of Rome! Woe to the vanquished!</i></p> <p>The student dressed as a soldier leaves the hall and returns in a couple of minutes for the last time, giving the students one more chance to finalise their drawings and translate the speech as accurately as possible.</p> <p>The students hand their drawings and translations in to be evaluated by the teachers.</p> <p>2. The students receive worksheets with mathematical tasks which are to be solved in groups. The first group to solve all the tasks correctly wins.</p> <p>The worksheets are marked by one of the school's math teachers.</p> <p>Online Latin dictionary: http://www.perseus.tufts.edu/hopper/</p> <p>Supplementary music video: <i>Legio Aeterna Victrix - Roman march. Lyrics.</i> https://www.youtube.com/watch?v=VkeLkuFzPfm</p>	<p>To present the topic in an engaging, visually appealing and integral way.</p> <p>To engage the students in multiple ways, combining different skillsets and abilities, including artistic, linguistic, and mathematical.</p>
Time:	45-60 min	



Stage 3: Evaluation		
IP:	<p>Having completed all of the tasks and their artwork displayed, the students are presented with the evaluation of their work, and the winners of separate activities are announced.</p> <p>The winners of each of the three tasks are presented with a complementary prize.</p> <p>I thank the students for their participation and wish them all the best during their stay in Slovenia.</p>	To evaluate students' work and draw conclusions regarding the topic.
Time:	10 min	

Math Tasks. Read the texts and complete the tasks!

1. Theodosius' army arrived in Vipava Valley on September 5th, 394. When had the army began its march from Constantinople, if the capital of the Eastern Roman Empire is 1600 km away from the valley and the soldiers managed approximately 14,5 km a day?

$$[1600 : 14,5 = 107 \text{ days} - 20. \text{may}]$$

2. Eugenius' army set out from Mediolanum (Milan), which is 420 km away from Vipava Valley on the last day of July, 394. At least how many kilometres per day did they have to walk, if they wanted to secure the valley 5 days before Theodosius' arrival?

$$[\text{at least } \frac{420}{30} = 14 \text{ km a day}]$$

3. Let's assume that two hersemen set out to Vipava Valley from Constantinople, which is 1600 km away, and Mediolanum, which is 420 km away, at the same time. How many hours a day should each of the two horsemen ride on average, if they are to arrive in the valley in 10 days, at the same time. They both ride with an average speed of 25 km/h and only stop for a few moments every so often to switch to fresh horses.

$$[\text{horseman from Constantinople: } 160 \text{ km / day or } 160:25 = \text{app. } 6.30 \text{ h / day}; \\ \text{horseman from Mediolanum: } 42 \text{ km / day or } 42:24 = \text{app. } 1.45 \text{ h / day}]$$

4. The locals erected a monument, called Theodosius' cross, above the alleged site of the battle, to commemorate it. It is 3 metres tall and weighs approximately 2500 kg. Each Roman soldier had to carry approximately 25 kilograms of equipment with them on military campaigns. How many Theodosius' crosses would equipment of one legion of Roman soldiers weigh?

$$[5000 * 25 = 125.000; 125.000 : 2500 = 50]$$



5. ADDITIONAL TASK!

Fill in the following grid with the digits 0–9 and the letter X so that each row and column is either a number or a mathematically correct statement.

The 1 may represent either the number 1 or an I in Roman numerals, and the X may represent either a multiplication symbol or an X in Roman numerals.

For example, the second row may be XXX (the number 30 in Roman numerals), or $5 \times 6 = 30$, or 3XX, where the first X represents multiplication, and the second X the number 10.

What an I or X represents in a row may not be the same as what it represents in the corresponding column. And as usual, no number can begin with a “0.”

Solution:

			20
			30
			12
6	100	40	

2	X	X	20
X	X	X	30
3	X	4	12
6	100	40	



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STEAM Lesson Plan

Category: **Physic,**

History, ICT, Math, Arts and crafts

School	Škofijska Gimnazija Vipava
Date	11.5.2022
Students	6 International groups
Teacher	Physic, Vladimir Anžel

Overview: Students are asked to sit around the tables in predetermined groups of 5-6. Experimental work: inside the limited space we reduce the pressure and the normal pressure of the surrounding causes something ... a few examples:

1. Drinking through a straw: We reduce the pressure in the mouth, the pressure of the surrounding air pushes the liquid through the straw.
2. Vacuum gripper - sucks on a smooth surface due to reduced pressure at the point of contact. Used by glaziers, potters ...
3. Vacuum hanger - when pressed on a smooth surface, it sucks - the ambient air pressure pushes it on a smooth surface
4. Cooking compote or jam - cooling the contents causes the pressure in the glass to drop - the ambient air pressure pushes the lid down
5. Fluid retention in the glass even if the glass is inverted. More for fun and not so much for use. For example, a postcard stays with a glass.

Suggested time: two class periods

Materials:

- drawing paper
- pencils
- worksheet
- experimental devices: Vacuum gripper, Vacuum hanger, cooking jam



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Objectives:

- To engage in experiential learning
- To develop problem-solving
- To embrace collaboration, and work through the creative process.
- To practice the 4Cs of the 21st century skills: communication, collaboration, creativity, critical thinking

Stages:

	Procedure of the lesson	Brief argumentation
Stage 1: Introduction		
IP:	<p>After a short break we started with the basic rules of laboratory work, make a hypothesis first and then check it.</p> <p>Students are asked to form six groups.</p> <p>For each group there is a paper where they will write the results. The vacuum hanger experiment is on one side, the inverted glass on the other.</p> <p>Later, they would have to solve some mathematical problems.</p>	To explain the tasks and prepare the students for their group work.

Stage 2: Group Work



IP:	<p>2. Part – eksperimental work</p> <p>In the next hour they will be divided into 6 groups, and they will do some simple experimental exercises.</p> <p>Their task is: in accordance with the basic rules of laboratory work, make a hypothesis first and then check it. Namely: they will find as many different surfaces as possible and check how many vacuum hangers suck on different surfaces. Why suck on some surfaces and not on others? If it sucks, is the maximum force exerted by the vacuum hanger still dependent on the size of the hanger? Please be careful when checking the maximum force that the vacuum gripper can withstand. Especially when you hang the heaviest weights. To your protection.</p> <p>They must chase weights all the time</p> <p>First 3 group will start with vacuum hangers.</p> <p>Second, they will check how the postcard or something else stays on the inverted glass or other container.</p> <p>Again, hypothesize whether all things remain on the glass. Does anything depend on the weight of the object on the glass? Does the diameter of the glass open affect anything? For those students who are a little better in math, can calculate, how maximal high can a glass be to hold a postcard when we turn it over? They will work on the funnel!</p> <p>For each group there is a paper where they will write the results. The vacuum hanger experiment is on one side, the inverted glass on the other.</p> <p>After 20 minutes the groups will change. Last five to ten minutes, the groups will report.</p>	<p>To present the topic in an engaging, visually appealing, and integral way. To engage the students in multiple ways, combining different skillsets and abilities, including artistic, linguistic, and mathematical.</p>
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Stage 3: Evaluation		
IP:	<p>Having completed all the tasks and their artwork displayed, the students are presented with the evaluation of their work. Presented their test results</p>	To evaluate students' work
Time:		

PRACTICAL WORK

VACUUM HANGERS

hypothesis					checking		
Number	type of surface	surface material	Diameter of hanger	sucks or not	sucks or not	If sucks -max force	other observations
1							
2							
3							

Why the hanger suck on some surfaces and not on others?



If the hanger sucks to the surface – is the max. force dependent on the surface of hanger?

Members of the group:

PRACTICAL WORK

INVERTED GLASS

hypothesis					checking		
Number	High of »glass«	Mass of »postcard«	Diameter of »glass«	Hold or not	Hold or not	If hold max mass	other observations
1							
2							
3							

Max high of inverted glass which hold »postcard«? Air pressure is: _____ hmax = _____

Members of the group:



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