Europeana Learning Scenario

Title

Math Challenge - “The Nobel Prize”

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Abstract

What is the Nobel Prize? Why is it called the Nobel Prize? Are you familiar with any Nobel Laureate? Students, in groups, investigate a specific category of the Nobel Prize laureates (Physics, Chemistry, Medicine, Literature, Peace and Economics) and select interesting aspects of their remarkable contributions. Based on this information, they create a Math Challenge to share their findings with the class. In this case, the Math Challenge involves solving a linear equation in one variable. After that, each group have to solve the other groups' challenges, giving and receiving peer-feedback to improve their work. Finally, each group presents to the class the results or solutions of their challenges, discussing and reflecting on their discoveries. Optionally, they organize a scientific exhibition about "The Nobel Prize" and publish their Math Challenges to present their discovers to a real audience.

Keywords

Maths; Nobel Prize; 12- 15; Interdisciplinary; Linear Equations ; Problem-solving

Table of summary

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Subject	*Interdisciplinary lesson – Mathematics, ICT and other(s) subject(s) related to the categories of the Nobel Prize (Physics, Chemistry, Medicine, Literature, Peace and Economics).*
Topic	*This lesson fits in the Mathematics curriculum for the seven grade (solving linear equations in one variable).*
Age of students	*12- 15*
Preparation time	*1 Session for teacher coordination.*
Teaching time	*1 Interdisciplinary Sessions (50 minutes) – To present the project, to explain about the Nobel Prize, to create the groups, to search and answer questions about a specific Nobel Laureate and find remarkable contributions.* *2 Mathematic Sessions (50 + 50 minutes) – Students solve problems and linear equations to become familiar with the process. After that, they create their Math Challenge based on an exciting aspect of the Nobel Laureate: they have to create a problem and solve it by a linear equation in one variable.*

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	2 Mathematic Session (50 + 50 minutes) – To solve the other groups' challenges and to give and receive peer-feedback to improve their work. *1 or 2 Technology Sessions (50 minutes) – To finalize and publish all work in an online wall of the class (e.g. Padlet); to create QR codes to publish the results or solutions of the challenge.* *1 Mathematic Session (50 minutes) – To present their final Math Challenge, discussing and reflecting on their discoveries.* *1 Interdisciplinary Session (50 minutes) – To organize a thematic exhibition to publish all work to the Whole School (optionally)*
Online teaching material	*List here all the links of online tools, applications and support documents that we will use during the lesson:* *5 minute video about Alfred Nobel and the Nobel Prize: https://www.youtube.com/watch?v=ykUXN0gkt7M&feature=youtu.be* *Wikipedia, with a list of categories and Nobel Prize laureates: https://pt.wikipedia.org/wiki/Laureados_com_o_Nobel* *Nobel Prize website: https://www.nobelprize.org/* *List of all Nobel laureates: https://www.nobelprize.org/prizes/lists/all-nobel-prizes* *Ted Lesson, How does the Nobel Peace Prize work? https://ed.ted.com/lessons/how-does-the-nobel-peace-prize-work-adeline-cuvelier-and-toril-rokseth* *Padlet https://padlet.com/ Online platform where students can share ideas about the work they will create.* *Mentimeter https://www.mentimeter.com for feedback.* *21 CLD Student work rubrics, http://fcl.eun.org/tool5p2*
Offline teaching material	*All the offline tools (to organize a thematic exhibition, QR codes, etc.)* *Text book, paper, poster board, colored pencil, glue, etc.* *Computer, internet access*
Europeana resources used	*Links of the Europeana resources used for this learning scenario:* *Europeana Blog (Nobel Prize) https://blog.europeana.eu/?s=nobel+prize* *Nobel Prizes: Economic Sciences* *Nobel Prizes 2012: Peace* *Nobel Prizes 2012: Literature* *Nobel Prizes 2012: Physics* *Marie Curie: An Inspirational Woman for International Women's Day* *Marie Curie* *Einstein's theory of relativity* *Exhibitions Pioneers,* *https://www.europeana.eu/portal/en/exhibitions/pioneers/maria-sklodowska-curie*

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Integration into the curriculum

This lesson could be used as an interdisciplinary project with Math, ICT, and other(s) subject(s) related to the categories of the Nobel Prize (Physics, Chemistry, Medicine, Literature, Peace and Economics).

Mathematics: *This lesson fits in the Mathematics Portuguese curriculum for the seven grade:*

- *Solving linear equations in one variable using standard algebraic properties.*
- *Problem-solving involving linear equations in mathematical and non-mathematical contexts, adapting, designing and implementing varied strategies, discussing the found solutions and the processes used.*

Technology: To support teamwork, to create QR codes and to publish the results or solutions of the Mat Challenge.

Physics, Chemistry, Medicine, Literature, Peace or Economics: To discuss and learn more about the Nobel Prize Laureates and their groundbreaking achievements, to inspire students to seek out knowledge, to question and to understand and improve our world.

Aim of the lesson

In this lesson, students will learn to write equations for given real world problems. They will write and create their own problem, write the equation and solve it.

Outcome of the lesson

Students will produce a final product, a Math Challenge related to an exciting aspect of a Nobel Laureate. Additionally, students can organize a scientific exhibition about "The Nobel Prize" to publish their Maths Challenges.

Trends

Students as Creators: students become more active producers and publishers of educational resources.

Collaborative Learning: a strong focus on group work.

STEAM Learning: Increased focus on Science, Technology, Engineering, Arts, Mathematics subjects in the curriculum

21st century skills

1. Content knowledge and 21st-century themes: This learning scenario focuses on Mathematics, ICT and other subjects, to promote an understanding of academic content by weaving interdisciplinary themes.

2. Learning and Innovation Skills: Students need to collaborate, have critical thinking, being creative and innovative to create their problem and solve it, and to explain and communicate the results.

3. Information, Media and Technology Skills: In this project, students have to use ICT tools to research, organize, create and present their findings.

4. Life and Career Skills: Students have to produce a product, respect deadlines, collaborate with a team and know how to explain their ideas. These activities are essential to developing thinking skills, content knowledge, and social and emotional competencies.

Activities

Name of activity	Procedure	Time
1) Inspire and explore (Interdisciplinary)	*1.Teachers inspire students to the theme of "Nobel Prize":* *- What is the Nobel Prize? Why is it called the Nobel Prize? Are you familiar with any Nobel Laureate? Do you know who the Portuguese Nobel laureates are?* *- Show a video about Alfred Nobel and the Nobel Prize.* *2. Teachers present the main ideas of the LS, negotiates the assessment criteria with students and presents the Europeana portal (to explain how to search for information).* *3. Create groups* *- Students create small teams (2 or 3 per group) to investigate a specific category of the Nobel Prize laureates.* *4. Teamwork:* *- Every group gets one Nobel Prize laureate.* *- They explore information about their Nobel to find remarkable contributions. They answer specific questions that guide their research (e.g. Why this Nobel Laureate received the Nobel Prize?).* *- They use the Padlet to post and organize their findings.* *They must pay attention to copyright issues regarding the data they collect.*	*50 min*
2) Create a Math Challenge (Mathematic)	*Teamwork:* *- Students solve several Math challenges based on solving equations to become familiar with the process.* *- After that, they start to create their Math Challenge, based on an exciting aspect of their Nobel Laureate: they have to create a problem and solve it by a linear equation in one variable.*	*50 min + 50 min*
3) Ask Peer – Feedback and remake (Mathematic)	*Teamwork:* *- Each team have to solve the other groups' challenges and give and receive peer-feedback to improve their work.*	*50 min + 50 min*

Name of activity	Procedure	Time
4) Enrich the investigation (Technology)	*Teamwork:* - *Students enrich and complete their work (add images, more information, links…) and publish it in the online wall of the class.* - *They create QR codes to publish the results or solutions of their Math Challenges.*	*50 min*
5) Present and evaluate (Mathematic)	*To present:* - *Each team has to present the results of their work to the all-class, discussing and reflecting on their discoveries.* - *During the presentation, the peers evaluate the other teams work using an online response system, like Mentimeter.* - *They also do a self- evaluation based on rubrics.*	*50 min*
6) *Publish (Interdisciplinary)*	*To go further, the class organize a thematic exhibition to publish the Maths Challenges and all work for the Whole School.*	*50 min*

Assessment

What do students produce when they complete a learning activity?

A "Student Work Rubric" uses big ideas to help teachers to assign a number from 1 to 4 (or 5), according to how strongly the student work demonstrates the given skill. This purpose is to help educators identify, understand and build learning activities that allow students to develop 21st-century skills.

In this project, we propose three rubrics developed by the Innovative Teaching and Learning (ITL) Research project to help the teacher to evaluate and promote skills of "collaboration", "problem-solving and innovation" and the "use of ICT for learning".

For "problem-solving and innovation" the rubric examines whether students' work demonstrates problem-solving and the use of data or situations from the real world. The strongest student work for this rubric demonstrates that the student:

- did not already know a response or solution to the task;
- developed a successful solution to a real-world problem;
- innovated by putting into practice his or her ideas, designs or solutions for others.

(Real-World Problem-Solving and Innovation: Student Work Rubric)

Assessment	% final mark	5	4	3	2	1
Collaboration (team work) observation	*30%*	*Students are sharing responsibility fairly* *They are making substantive decisions together* *Their work product is interdependent.* *(Collaboration: Student Work Rubric)*	*Students are sharing responsibility fairly* *They are making substantive decisions together* *But their work product is not interdependent.* *(Collaboration: Student Work Rubric)*	*Students are sharing responsibility fairly* *But they are not making substantive decisions together.* *(Collaboration: Student Work Rubric)*	*Students are working together* *But they are not sharing responsibility fairly.* *(Collaboration: Student Work Rubric)*	*Students are not working together in pairs or groups.* *(Collaboration: Student Work Rubric)*
Real-World Problem-Solving and Innovation (team work) observation	*40%*		*The student's main effort was problem-solving* *The solution did address a real-world problem* *The solution was successful* *The students did innovate. He or she did implement a solution in the real world.* *(Real-World Problem-Solving and Innovation: Student Work Rubric)*	*The student's main effort was problem-solving.* *The solution did address a real-world problem.* *The solution was successful.* *But they did not innovate. He or she did not implement a solution in the real world.* *(Innovation requires putting students' ideas or solutions into practice in the real world).* *(Real-World Problem-Solving and Innovation: Student Work Rubric)*	*The student's main effort was problem-solving.* *But the solution did not address a real-world problem* *(e.g. did not involve the use of actual data like historical event)* *or* *The solution was not successful.* *(e.g. the solution have unrealistic assumptions or obvious misstatements of fact)* *(Real-World Problem-Solving and Innovation: Student Work Rubric)*	*The student's main effort was not problem-solving.* *(e.g. Students did not have to develop any solutions. They were not addressing a defined challenge.)* *(Real-World Problem-Solving and Innovation: Student Work Rubric)*
Use of ICT for Learning (team work) observation	*30%*	*Student work demonstrates use knowledge construction*	*Student work demonstrates knowledge construction*	*Student work demonstrates knowledge construction*	*Students used ICT* *But the work does not*	*Student work does not demonstrate ICT use.*

		supported by ICT *The ICT was required for constructing this knowledge* *Students designed a product that demonstrates attention to authentic users in its design.* *(Use of ICT for Learning: Student Work Rubric)*	*supported by ICT* *The ICT was required for constructing this knowledge* *But students did not design an ICT product for authentic users.* *(Use of ICT for Learning: Student Work Rubric)*	*supported by ICT* *But students could have constructed the same knowledge without using ICT.* *(Use of ICT for Learning: Student Work Rubric)*	*demonstrate knowledge construction supported by ICT.* *(Use of ICT for Learning: Student Work Rubric)*	*(Use of ICT for Learning: Student Work Rubric)*

********** **AFTER IMPLEMENTATION** **********

Student feedback

Add here the method with which your students will be able to give you feedback and discuss the lesson.

The Teacher uses Mentimeter to ask students to provide feedback about the work developed and what they think about using the Europeana for this type of research. Important also to ask students how this activity was important concerning their learning and knowledge acquirement. They could make a video or record audio using the Padlet applications and post on the group mural.

Teacher's remarks

*Add here your comments and evaluation **AFTER** the implementation of this lesson. You can always use a rubric for self-assessment.*

Before the step of creation, depending on the student's level of maturity, teachers should provide several math challenges based on problem-solving and linear equations making sure that students are familiar with the process. Students could use those problems to create a new challenge or adapt an existing one. If there is no Internet, teachers can provide Europeana printed texts.

About the Europeana DSI-4 project

Europeana is Europe's digital platform for cultural heritage, providing free online access to over 53 million digitised items drawn from Europe's museums, archives, libraries and galleries. The Europeana DSI-4 project continues the work of the previous three Europeana Digital Service Infrastructures (DSIs). It is the fourth iteration with a proven record of accomplishment in creating access, interoperability, visibility and use of European cultural heritage in the five target markets outlined: European Citizens, Education, Research, Creative Industries and Cultural Heritage Institutions.

European Schoolnet (EUN) is the network of 34 European Ministries of Education, based in Brussels. As a not-for-profit organisation, EUN aims to bring innovation in teaching and learning to its key stakeholders: Ministries of Education, schools, teachers, researchers, and industry partners. European Schoolnet's task in the Europeana DSI-4 project is to continue and expand the Europeana Education Community.

Annex