

Europeana Learning Scenario

Title

Playing with cards in Mathematics

Author(s)

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Abstract

This learning scenario combines game-based learning in mathematics and learning history based on Europeana recourses. Taking as starting point the history of card games, students play the game of examination in arithmetic representations, as they try to implement the appropriate operations to calculate the target number by 4 numbers, which are randomly selected by 40 cards (cards without figures). Furthermore, being motivated by the interdisciplinarity of teaching mathematics based on digital cultural heritage of Europeana recourses, students are guided to design problems and included them in cards in order to produce a new card game, as the correct answer is a selection of 3 multiple choices. This learning scenario could be implemented face to face or by distance learning in ages 14-17, not only in the mathematics class, but also in science classes (biology, physics, chemistry, etc.), as the component of designed problem could be modified according to the concepts of these lessons.

Keywords

Mathematics, Algebra, card games, numbers, problem solving.

Table of summary

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Subject	Mathematics, STEM
Topic	<p>Mathematics: Problem solving with many mathematical concepts (e.g. percentages, equations, input of variables, systems of equations)</p> <p>Algebra: arithmetic representations using the priority of operations</p> <p>Technology: Using digital tools and apps for presentation and collaboration</p> <p>Science: Any concepts by curriculum included in problem solving (e.g. energy, forces etc.)</p> <p>Engineering: The process of design thinking in order to identify and solve problems, understand professional and ethical responsibility and communicate effectively.</p>
Age of students	13-17
Preparation time	100'
Teaching time	80'
Online teaching material	<p>Learning for history of card games:</p> <p>Article by BoardGameGeek reviewer EndersGame about The History of Playing Cards: The Evolution of the Modern Deck</p> <p>You Tube video about history of Card Games</p>



	<p>You Tube video about history of Playing Cards explained in 5 Minutes</p> <p>Quick Quiz: Card Games and Games of Chance</p> <p>Discussions and open-ended speeches</p> <p>Playing new designed games</p> <p>Survey for students' self-evaluation and evaluation the learning process:</p> <p>Polleverywhere</p> <p>Surveymonkey</p> <p>For creations rubrics for refining the Learning Activities that have been designed and tested in the classroom with a particular emphasis on 21st century skills.</p> <p>21 CLD Student work rubrics</p> <p>Guidelines of 21CLD rubric cheat sheet</p>
Offline teaching material	<p>Papers for keeping notes in order to design and solve problems</p> <p>Maths textbooks (especially algebra of 1st class of High School) for i) searching mathematical concepts that students will include in the design of problems ii) reviewing methods of mathematical problem solving</p> <p>Chronometer</p>
Europeana resources used	<p>Collection by galleries of Europeana: Playing Cards</p> <p>Item 1</p> <p>Item 2</p> <p>Item 3</p> <p>Item 4</p> <p>Item 5</p>

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Integration into the curriculum

This learning scenario can be integrated into the curriculum of mathematics in secondary school, as arithmetic representations and problem solving are basic components of the curriculum in Algebra from 1st class of secondary school till the 3rd class of high school. In other words, it could be implemented with students aged 13-17, who could modify the problems with the mathematical knowledge that they have learned or they are learning.

Aim of the lesson

This interdisciplinary lesson aims at

- Motivating students to search for information and getting knowledge for cultural heritage by the Europeana portal
- Reviewing students' mathematical knowledge
- Developing students' creativity and innovation, flexibility and adaptability and problem-solving skills

- Developing students critical thinking through playing game cards games for arithmetical representations

The challenge of this lesson is that students take an active role in designing problems with mathematical concepts by any chapter of their textbooks, out of the traditional way of learning, where teachers asked students to solve the mathematical problems included in text books. Moreover, the additional value is that the designed problems are based on materials of cultural heritage, so they focus on making connections with history, art, fashion etc. with mathematics.

Outcome of the lesson

Students implement mathematical knowledge to learn about cultural heritage (not just history of card games) and vice versa, they examine mathematical knowledge based on cultural heritage.

Students search for information into the collections of cultural heritage of the Europeana portal and create the [quiz game](#) based on problems and solutions that they have designed with materials of digital cultural heritage found in Europeana.

Trends

Project-Based Learning: students get fact-based tasks, problems to solve and they work in groups.

Game Based Learning & Gamification: learning is mixed with games or with game mechanisms

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

Student Centered Learning: students and their needs are at the center of the learning process.

Peer Learning: students learn from peers and give each other feedback.

Flipped Classroom: students master basic concepts of the topic at home. Time spent in classroom is used to reflect, discuss, develop topic.

Cloud-based learning: Students will have the opportunity to reach the materials they have learned, by themselves, or in collaboration with their peers, or with the teacher, whenever they need, the lessons in Google Classroom.

Open-Source Learning: teachers copy, share, adapt, and reuse free educational materials.

Social media: teacher share some of their results on social media with hashtags #Europeana #SDC #Playing_Europe

21st century skills

Creativity and Innovation:

- see concepts in a different light, which leads to innovation.
- Students elaborate, refine, analyze, and evaluate their own knowledge of STEM lessons, in order to improve and maximize creative efforts in order to design a problem.
- Act on creative ideas to make a tangible and useful contribution to the field of calculations with different operations.

Critical Thinking and Problem Solving:

- Synthesize and make connections between digital cultural materials and mathematics
- Reflect critically on learning experiences and processes
- Solve different kinds of non-familiar problems in both conventional and innovative ways

Communication:

- Use information accurately and creatively for designed problems to discuss, through playing with their classmates

Information Literacy:

- Understanding facts and figures and learning their meanings through ages

Flexibility and adaptability:

- Expressing the ability to adapt to changing ways of presentation of knowledge of mathematics in connection with real world
- Adapting to varied roles, job responsibilities, schedules, and contexts
- Working effectively in a climate of ambiguity and changing priorities

Activities

Name of activity	Procedure	Time
Introduction	The teacher investigates students' knowledge about cultural heritage for games and especially for card games (QR codes included in Annex 1) i) Word Cloud: What does cultural heritage include? , ii) Open Ended/ Speeches Famous ancient & card games in Greece	15'
Flexible reading&learning	<p>Teacher introduces to students the cultural heritage of card games included in Europeana portal, using the collection found in the galleries of Europeana: Playing Cards and items such as Item 1, Item 2, Item 3, Item 4, Item 5</p> <p>As homework students will read the article by BoardGameGeek reviewer EndersGame about The History of Playing Cards: The Evolution of the Modern Deck. Also, they will watch YouTube videos about i) history of Card Games ii) history of Playing Cards explained in 5 Minutes</p> <p>Teachers suggest that students collaborate in preparation of history of card games, as they could work in groups via on line discussion tools (calls in viber or messages or Skype meetings).</p> <p>Via online distance learning, students share their opinions and discuss with their classmates via speeches what impressed you the most (QR code included in Annex 1) Moreover, teacher highlights that peoples have to use card games to have fun in their free time and explains to students that the objective of this lesson is learning mathematics via card games.</p>	15' (+40'preparation as homework)
Card games & arithmetic representations	<p>Teacher explains to students the rules of the games: We need a photo of the 40 cards of a deck without the figures arranged in a row, giving the corresponding numbering. Each time we choose 5 cards at random, the first card is the target number, which must be formed by the appropriate operations with the correct priority, necessarily from the numbers of the other 4 cards. In an excel sheet there is a column with numbers from 1 to 40, in any 5 cell of other columns we insert the function RANDBETWEEN (1,40) in order to have 5 numbers of the cards of deck. For example: when the first random number (e.g. in B2) is 21, it corresponds to card number 1 of the deck in the photo. When the other 4 random numbers are 39, 15, 7, 25, and then they are corresponding to cards with 9, 5, 7, 5 of the deck in the photo. This means that students have to create an arithmetic representation to calculate 1 by numbers 9,5,7,5 using calculations. e.g. $1 = (9+7+5)/7 - (7-5)$. There is no limit in the times of using the 4 numbers and there are limits in times of using each operation. For each round, each student has 1 minute and gets 2 points for each correct solution and 1 point if his/her calculations differ +, - 1. Students may work in groups using breakout sessions of WebEx, but it needs more time.</p>	30'

Name of activity	Procedure	Time
Create new card games	Teacher motivate students to create a new card game based on materials of collections of digital cultural heritage of Europeana and problem solving. Students could select any concept by science included in their curriculum and create problems. They have to solve them and add three possible answers. In the presentation template there are instructions and examples. Also, students have to present the solution of the designed problems. The teacher could guide students to modify each slide of presentation into a card (picture). All of the cards will be inserted in the web environment and students could enjoy the problem solving with the quiz game	60' preparation as homework +20' on line by distance learning

Assessment

The assessment of this learning scenario includes i) [the rubric worksheet](#) for evaluation activities of it and ii) [worksheet for evaluation students' development skills](#)

Student feedback

After the implementation of the learning scenario students (Annex 2):

- Describe with few words or sentences your feelings and impressions for this lesson [in the poll](#)
- Fill the [survey for self-assessment](#) the development skills
- Fill the [survey for evaluation](#) the activities of the learning scenario

Teacher's remarks

The motivation of creating a learning scenario based on history of card games is the Erasmus+ KA229 project '[Playing Europe](#)', in which the school where I work as a Maths teacher (Evangeliki Model High School) is a partner. According to its framework, games contain a cultural and traditional value in every EU country, which we can integrate in our teaching methods. Moreover, gamification in the classroom is not yet widespread, since games tap into 21st century skills, like problem-solving, collaboration, negotiation, which do not necessarily constitute the bedrock of our current educational system.

In these terms, I try to combine Europeana collections with learning mathematics through game-based learning, with starting point the history of card games, but I expand the learning of cultural heritage in many materials of the Europeana collections.

This learning scenario was implemented with the 1st class of Evangeliki Model High School of Smyrna by distance learning. The results of the implementation (see Annex 2), which are presented in students' feedback, highlight that students enjoyed the activities. It was a very interesting lesson which helped developed 21st skills.

This learning scenario could be modified in many STEM lessons, as teachers could asked for students to create problems by physics, chemistry, technology.

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.

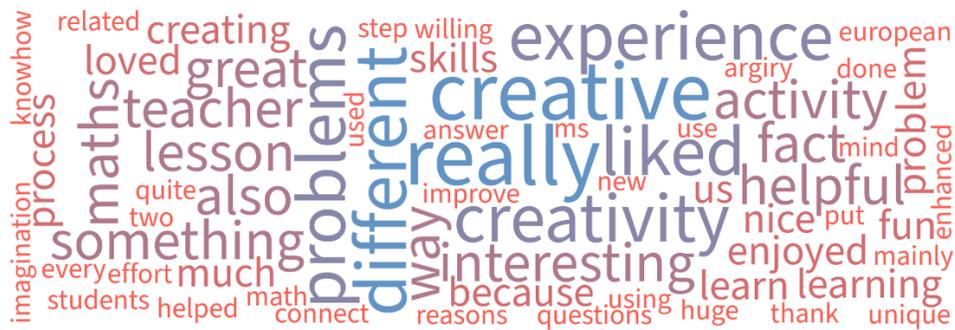
Annex

Annex 1

		
What cultural does heritage includes?	Do you know any ancient games in Greece? Do you know any famous card games?	What impressed you the most?

Annex 2

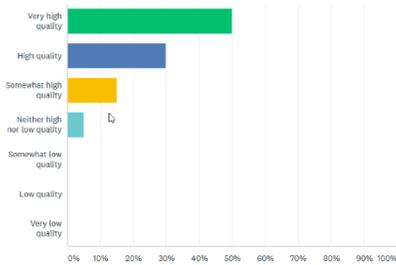
Describe with few words or sentences your feelings and impressions for this lesson?



Self-assessment of development skills

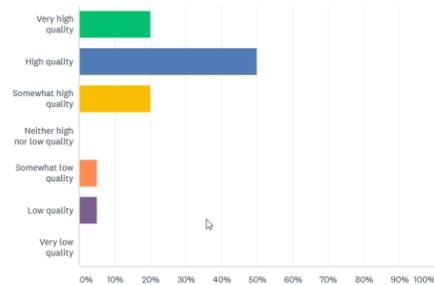
Creativity

Answered: 20 Skipped: 0



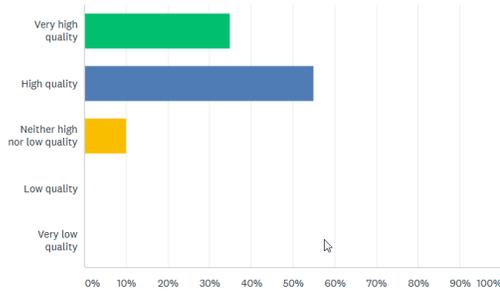
Critical thinking

Answered: 20 Skipped: 0



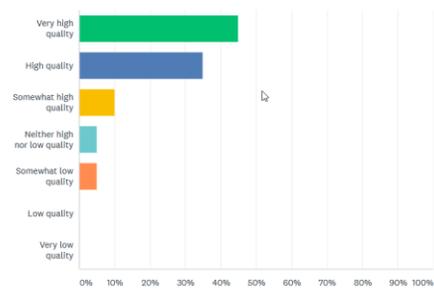
Information analysis

Answered: 20 Skipped: 0



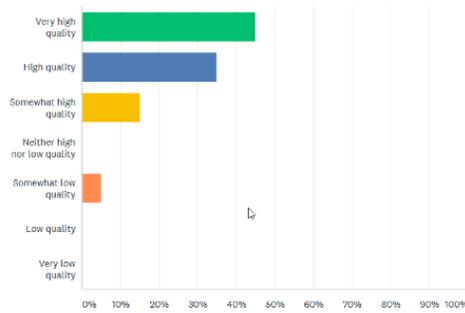
Flexibility and adaptability

Answered: 20 Skipped: 0



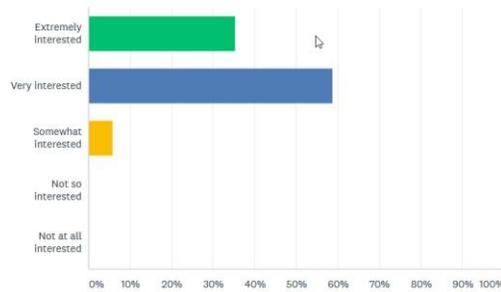
Problem Solving

Answered: 20 Skipped: 0



The connection between cultural heritage and mathematics was

Answered: 17 Skipped: 0



Any other skills that do you think that you have developed

'The ability to adapt my idea in order to make it a solvable problem', 'Combinatorial thinking, Imagination', 'memory, a nice practice for our skills in English', 'I developed my speed on solving problems', 'fast thinking', 'reading mathematical problems combined with cultural heritage'

What do you like most?

'The fact that we should make problems linked with daily life', 'the fact that we ourselves had to create our own problems instead of just solving others' problems', 'Being given the chance to do something creative', 'learning about other cultures, traditions and way of living', 'the opportunity to create something on my own', 'I really liked the variety and creativity of the problems', 'I liked that through this activity we connected two fields that do not seem to have a lot in common.'