Europeana Learning Scenario

Title:

Tangram: an ancient educational material

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Summary:

The LS explores tangram as educational material. Initially, students research mathematics textbooks and identify the thematic areas using tangram. They then research the Europeana Collections information on tangram, and particularly the ancient Greek mathematicians Pythagoras and Archimedes, who devised tangram, respectively. They then discover tangram's relation to the proof of geometrical problems, such as Pythagorean Theorem. As a final activity, some students design and construct Pythagoras tangram, Archimedes "ostomachion" or tangram, while others create their own tangram inspired by the material from the Europeana Collections.

Table of summary	
Subject	Mathematics, History
Topic	Tangrams and Pythagorean theorem
Age of students	11-12 years old or older The students need to have advanced digital skills, specific to GeoGebra.
Preparation time	Preparation time (90min) will be needed, to prepare students to use web tools, to familiarize with the Europeana Collections and the Creative Commons and to use tangram.
Teaching time	Teaching time (180mim) will be needed, to research the Europeana Collections, to familiarize students with web tools and to include hands-on working to design and construct tangrams.
Online teaching material	Online tools: GeoGebra Geometry Timetoast Prezi Resources: Historiana
Offline teaching material	• tangram, geometrical instruments • paper, cardboard, pencils, etc
Europeana resources used	Key words: Tangram Pythagoras theorem Pythagoras Archimedes

Co-financed by the Connecting Europe Facility of the European Union

Licenses

Integration into the curriculum

The LS has an interdisciplinary scope, which is based on objectives of 3 different subjects, included in the 6th grade of primary school Greek curriculum. Mathematics: there is a proposal to use tangram to prove the Pythagorean theorem. History: students are invited to research the history of tangram in different times and people, the geometric theorem of Pythagoras, and the tangram of Pythagoras and Archimedes as educational material. Art: students are invited to design and construct tangram and to think and discuss similarities with painting streams.

Aim of the lesson

The LS aims that the students understand:

a) to link mathematic thinking and art

b) to realize the used material to prove a mathematic problem such as Pythagorean theorem

c) to realize how different people at different times used similar ways and constructions to prove the Pythagorean theorem

d) to know that the different paths of mathematical thinking are original and fun

Outcome of the lesson

Students are expected to produce many different results upon completion of the activities.

a. a timeline with a tangram story

b. a presentation with different proofs of Pythagorean theorem

c. Designs and construction of Pythagoras' tangram and Archimedes' "ostomachion"

d. Designs and making (digital or handmade) their own tangram with artistic references

Trends

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

Collaborative Learning: students work in groups in most activities of this LS.

Edutainment: the final activity helps students to learn while having fun.

Visual Search & Learning: during the project students mostly work with material or images which depict the tangram.

Learning Material: this LS uses mostly web resources than textbooks to achieve its goals.**21st century skills**

Learning and innovation skills

- Creativity: students are asked to create their own designs of the tangram putting their own creativity into action.
- Critical thinking: students are asked to think about the link of mathematic thinking, art and material
- Collaboration: students need to work in groups in order to complete most of the tasks.

Information, media and technology skills

- ICT Literacy: students are asked to use several web tools as well as digital resources during the activities.

Activities

Name of activity	Procedure	Time
Activity 1: Research on the topic	Initially the introduction can be can on the topic in the schoolbook by the teacher, Students discuss it (Pythagorean theorem and proof by tangram). The discussion will mainly focus on mathematics and art. Afterwards, students search the Europeana Collections for pictures of the Pythagorean theorem, tangram and other mathematicians such as Archimedes who designed and constructed their own tangram. Students can use Historiana	30min
Activity 2: (group work) Understanding	Then students work to understand the relationship between Pythagorean theorem and tangram. They try to prove the Pythagorean theorem (the square of the hypotenuse equals the squares of the other two sides) by using the pieces of tangram. They can use material such as tangram, triangle, etc or the digital tools on Geogebra	45min
Activity 3: (group work) Historic timelines	Subsequently observing several texts, images and presentations, students work in groups, to create the timelines and presentation for the Pythagorean theorem and tangram. Students can use Prezi and Timetoast	75min
Activity 4: (group work, creation)	Finally, students create their own tangram, inspired by geometric art or new waves of art. They try to transform the cut pieces of tangram (but based on the relation between Pythagorean theorem and tangram). The groups present their designs in the classroom and get feedback from the other students	30min

Assessment

Students Groups are assessed through a discussion in the class, through the outcomes produced for each activity on to the following criteria:

Collaboration: Have all members contributed to the group work? Have they reached decisions collaboratively? Have they shared responsibilities between them?

Completion of work: Has the group completed all the anticipated outcomes on time?

Quality of the outcome: Have they followed the instructions given? Is there a creative element in their work? Have they attributed images according to the creative commons?

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

Student feedback

Students were asked to evaluate the implementation of the script by answering the following questions in small texts:

a. What did they like most about implementing the LS?

b. What would they like to work on more?

c. What points would they like to differentiate and how?

Teacher's remarks

The implementation of the LS enabled the students to conduct a thorough cross-disciplinary study of the subject. The students had the opportunity to be trained on new digital tools, explore the Europeana Collections, reflect on and think of new solutions, and learn through the STEAM method. The students' final activity gave them creative motivation, practicing their imagination while maintaining mathematical positions. The students, working in groups, benefited from the development of social skills. The evaluation that followed helped them analyze and understand the multiple levels of the LS.

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.